The REFINER
AND NATURAL GASOLINE MANUFACTURER

Steam Jets *for* HIGH Vacuum

Elliott Steam Jet Ejectors, in many oil refineries in this country and abroad, are demonstrating the advantages of high vacuum distillation.

Each of these ejectors was designed to fit the conditions peculiar to the still it is serving.

In some refineries, they are removing fixed gases only, in others a mixture of fixed gases and steam. Some of these ejectors are accomplishing a compression of only 1.5 inches of mercury and some as much as 25 pounds, with suction pressures as low as 3 mm. of mercury, absolute.

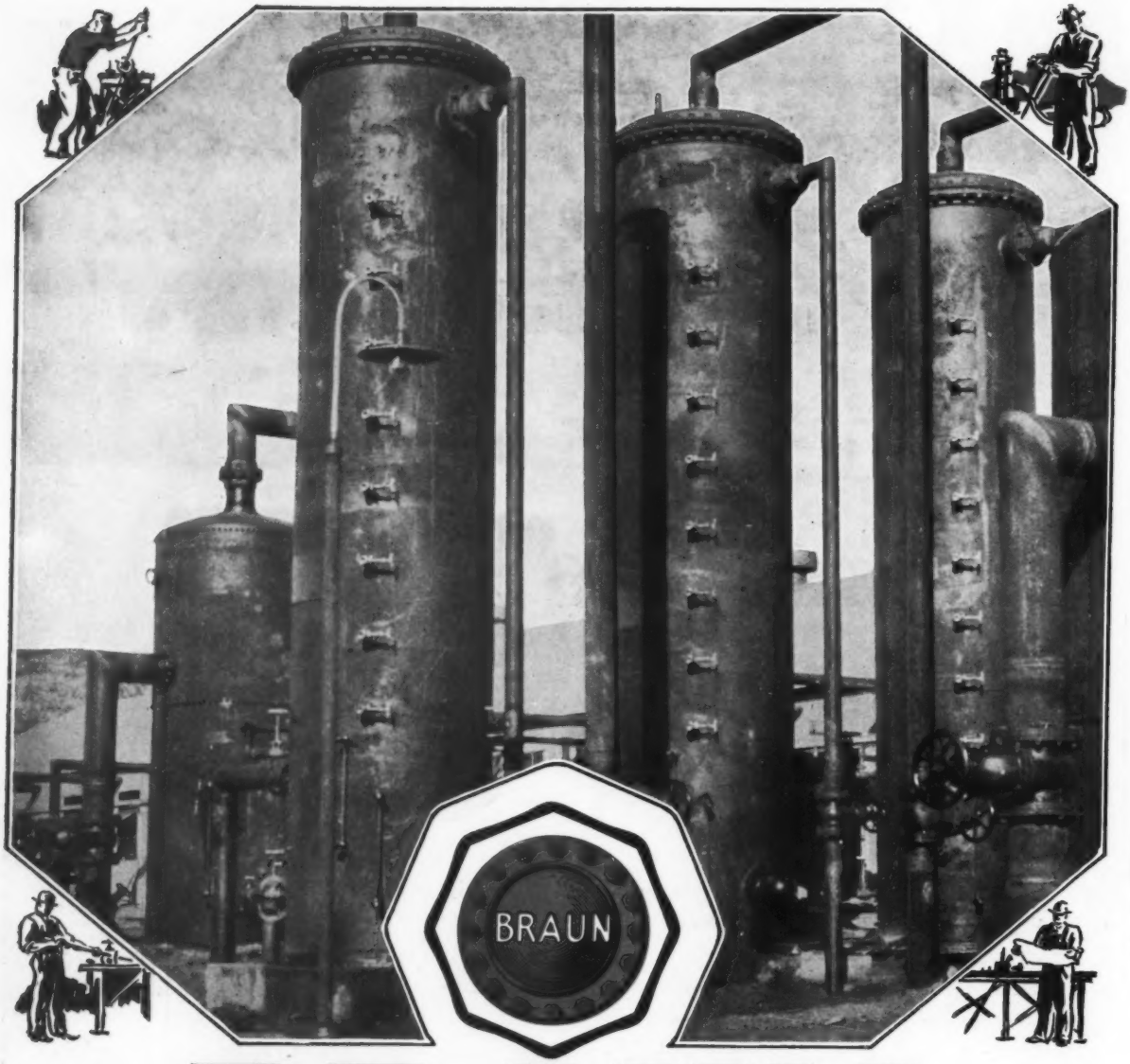
A wealth of experience in the application of high vacuum equipment to oil refining processes is at your service.

Elliott Company also manufactures complete vacuum equipment for lubricating oil stills.

Elliott booster ejector designed to compress 1100 lbs. of vapor per hour from a pressure of 7 mm., absolute to 50 mm., absolute.

ELLIOTT COMPANY
PITTSBURGH, PA.
General Offices **JEANNETTE, PA.**
Sales Offices in principal cities
The pioneers of commercial high vacuum

C-309



BRAUN
BUBBLE TOWERS

Flexibility----performance equally good over a range of from 10% to 100% of rated capacity----is characteristic of BRAUN Bubble Stills, Absorbers, and Rectifiers. At much higher, and even lower, rates, the change in efficiency is scarcely appreciable.

C·F·BRAUN & CO. *Manufacturing Mechanical* **ENGINEERS**
ALHAMBRA CALIFORNIA
TULSA DALLAS NEW YORK

Entered as second class matter June 16th, 1923, at the Postoffice at Houston, Texas, under the Act of March 3, 1879.

SENSITIVE ACCURATE RELIABLE

Absolutely
NO FRICTION

NEILAN BALL BEARING LIQUID LEVEL CONTROLLERS

The Neilan *Ball Bearing* Liquid Level Controller will hold the level of liquid in absorbers, stills, and tanks with only the slightest variation.

For high gravity gasoline it will give perfect satisfaction notwithstanding the low buoyancy of the gasoline, and reduced power of the float.

It is sensitive, accurate and reliable; ball-bearing construction eliminates all friction; and it costs no more than ordinary liquid level controllers.

The Neilan Float Chamber has a ball thrust bearing inside, and an outboard ball bearing carried in a malleable iron yoke. No power is lost through friction, sticking or binding as in the old style bearings and stuffing boxes used in other makes of liquid level controllers. The full power of the float is delivered to the valve.

Screwing up the stuffing box nut with the fingers makes the stuffing box sufficiently tight to prevent any leakage without binding the stem. The malleable iron yoke and outboard bearing rigidly supports the stem and prevents distortion, binding or side-thrust.

Made in cast iron and cast steel for working pressures of 150 lbs. and 400 lbs., and temperatures up to 900° F. Furnished with seamless copper, steel, nickel plated and lead coated floats, with three different types of valves. Detailed description. Illustrations and prices on request.

NEILAN, SCHUMACHER & CO.
641-651 Santa Fe Avenue, Los Angeles, California
Branch: 327 E. South Street, Tulsa, Okla.
P. H. Wilkinson, Manager
Representatives:

Maintenance Engineering Corp., 2000 Harrington Street, Houston, Texas

NEILAN

Pelican Well Tool & Supply Company, Shreveport, La.

"You Can Be SURE of Neilan Products"

These Distributors stock ADAMANT in 100 lb., 250 lb., and 400 lb. containers. Distributors are listed under state and city, with states arranged alphabetically.

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Young and Vann Supply Company
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California, San Francisco,
W. E. Musbet Co.
Colorado, Denver,
H. W. Thompson
Connecticut, New Britain,
Rackliffe Bros. Co., Inc.
Connecticut, New Haven,
The Warner-Miller Co.
Illinois, Chicago,
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Indiana, Fort Wayne,
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Indiana, Indianapolis,
Indianapolis Belting & Supply Co.
Iowa, Des Moines,
The Walrath Supply Company
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Woodward Wight & Company, Ltd.
Louisiana, Shreveport,
Woodward Wight & Company, Ltd.
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Massachusetts, Springfield,
Oscar F. Carlson
Massachusetts, Worcester,
Waldo Bros. and Bond Company
Michigan, Detroit,
H. D. Edwards & Co.
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Duluth Builders Supply Co.
Minnesota, Minneapolis,
Northern Machinery & Supply Co.
Missouri, Kansas City,
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Reed Railway Supply Co.
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American Machinery & Supply Co.
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New York, Mohawk,
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C. C. Phillips, 116 W. 34th St.
New York, Rochester,
American Clay & Cement Corp.
Wm. Summerhays & Son
New York, Rome,
The American Hard Wall Plaster Co.
New York, Syracuse,
The Paragon Plaster Company
New York, Utica,
The American Hard Wall Plaster Co.
North Carolina, Asheville,
Southern Steel & Cement Company
Ohio, Cincinnati,
The Wm. T. Johnston Co.
Ohio, Cleveland,
The Cleveland Tool & Supply Co.
Ohio, Columbus,
The Westwater Supply Co.
Ohio, Dayton,
The Klinger-Dills Co.
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The Toledo Builders Supply Co.
Oklahoma, Tulsa,
Standard Asbestos & Cork Company
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The Gas Combustion Company
Post Office Box No. 1753
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Reading Foundry and Supply Co.
Rhode Island, Providence,
B. & H. Supply Co., Inc.
South Carolina, Columbia,
Columbia Supply Company
South Carolina, Spartanburg,
Spartanburg Mill Supply Co.
Tennessee, Memphis,
Reed and Duecker
Texas, Beaumont,
Norvell-Wilder Hardware Company
Texas, Corpus Christi,
San Antonio Machine & Supply Co.
Texas, Dallas,
The Murray Company
Texas, El Paso,
Geo. S. Thomson Company
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Norvell-Wilder Hardware Company
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San Antonio Machine & Supply Co.
Texas, Waco,
San Antonio Machine & Supply Co.
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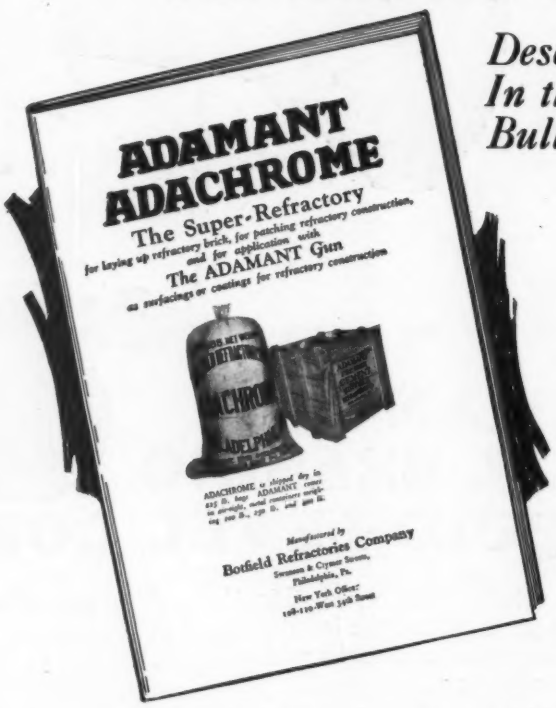
New!

Super-Refractory Mixtures For Refinery Service



Described In this Bulletin

SEND FOR A COPY!

FOR use in building still settings, boiler furnace and other fire brick construction in the refinery, there has been a very definite need for a super-refractory material with high resistance to the attack of fusible coal ash, slags, clinker, sulphur and other impurities in either coal, gas or oil fuel which cause fluxing, slagging or melting of brick and shorten refractory life.

With the development of the ADAMANT-ADACHROME Mixtures, this Super-Refractory has been provided.

Being chemically-neutral and highly-refractory, ADAMANT-ADACHROME is unaffected by most of the destructive actions produced in combustion—a property which naturally prolongs refractory service.

ADAMANT-ADACHROME Mixtures can be used for laying up fire brick, for patching and for surfacings applied with The ADAMANT Gun. Every refinery man should be familiar with the ADAMANT-ADACHROME Mixtures, described in a new booklet. Send for as many copies as you can use.

Botfield Refractories Co.
783 S. Swanson St., Philadelphia, Pa.

For A Long Furnace Run, Use The ADAMANT *Gun*

ADAMANT
FIRE BRICK CEMENT

Whenever You Use a Fire Brick, Use ADAMANT, *The Original High Temperature Cement*

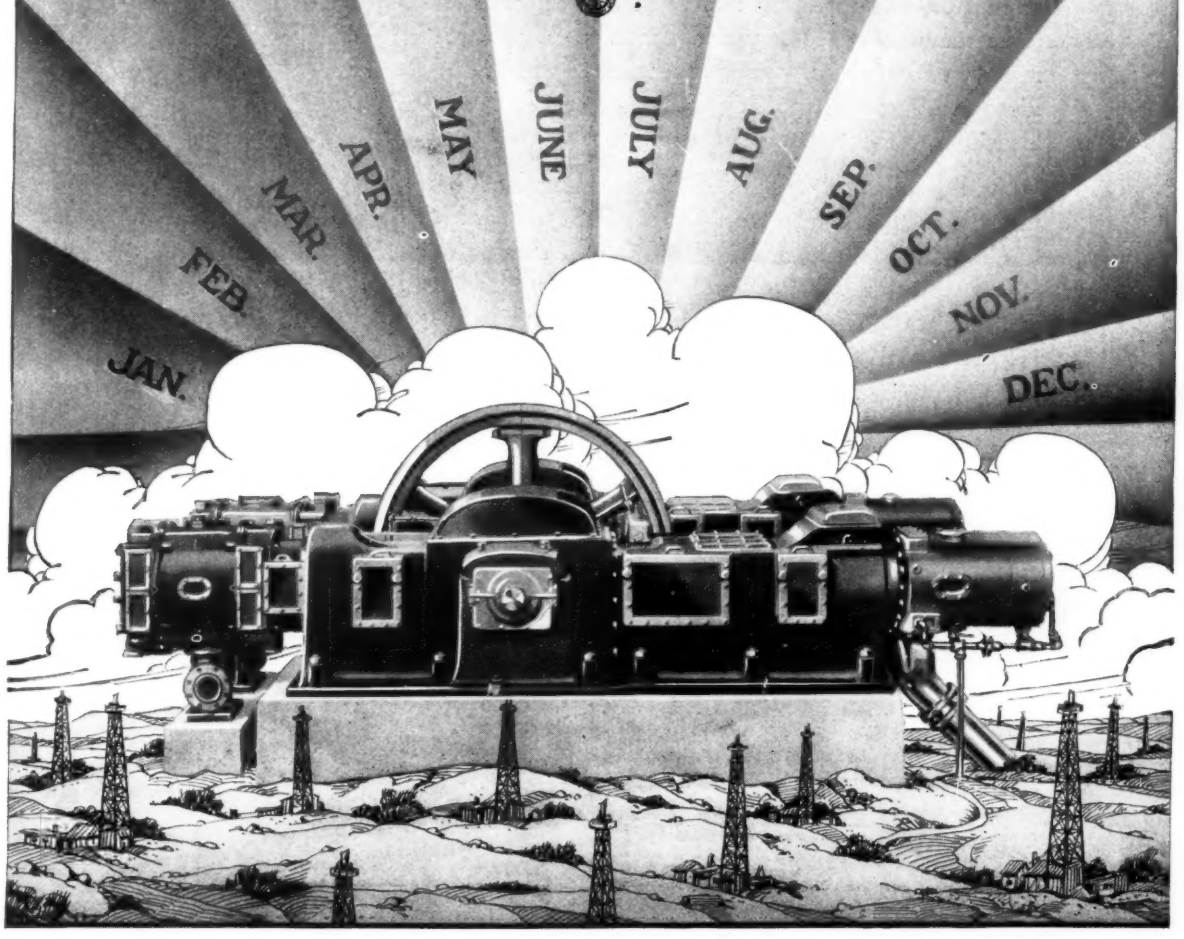
'ROUND THE CALENDAR

THE degree of Bessemer Compressor performability can best be gauged by their month-in-and-month-out operation on all types of compressor work. With their high mechanical and compressor efficiency, with their rugged simplicity and easy accessibility of all parts and with their utter dependability, Bessemers offer an unmatched value for natural gasoline plants, booster stations and for flowing wells.

THE BESSEMER GAS ENGINE COMPANY
18 York Street ∴ ∴ Grove City, Pa.

BESSEMER

BESSEMER OIL FIELD ENGINES – COMPRESSORS – VACUUM PUMPS – ROLLER PUMPING POWERS



Mention Where You Saw the Advertisement

The same duty in almost half the length

The G-R Twin Heat Exchanger

is only a little more than half the length of a single unit designed for the same duty.

This means a more compact apparatus, with less expansion and resulting strains on piping connections, smaller space required for tube bundle removal, and high salvage value because of ease of disconnecting, transporting and re-erecting at new locations to meet changing conditions.

And these are only part of the advantages of the G-R Twin Heat Exchanger. This unit, used for interchanging heat between crude oil feed stock and still bottoms, cold water and hot oil, etc., will speed up your refining operations and reduce your refining costs.

Send for Complete Information

THE GRISCOM-RUSSELL COMPANY

285 Madison Avenue, New York

Philadephia	Chicago	St. Louis	San Francisco
Boston	Cleveland	Kansas City	Los Angeles
Rochester	Detroit	Charlotte	Seattle
Pittsburgh	Milwaukee	New Orleans	Denver
Columbus	Indianapolis	Houston	Salt Lake City
Atlanta	Minneapolis	Dallas	Tulsa

For Canada: Riley Engineering and Supply Co., Ltd., Toronto

Note these other G-R units for lower refining costs

G-R Sectional Condenser

for condensing hydrocarbon vapors and other vapors. Can be used either as a standard or reflux condenser. The sectional arrangement permits using as a condenser and heat exchanger in one set or to obtain a different cut from each section.

Mineral Seal Oil Heat Exchangers

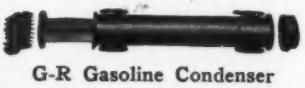
A compact, twin exchanger with strict counter-current flow to promote maximum rate of heat interchange.

G-R Vaneflo Gas Cooler

for cooling casinghead or natural gas. Can be used as inter-, after-, or precooler in absorption and compression type natural gasoline plants. Has low pressure loss and exceptional efficiency.

G-R Jacket Water Cooler

Uses any source of raw water to cool the jacket water from oil and gas engines and compressors. The famous Multiwhirl Cooler—Thousands in operation in every liquid cooling service.



G-R Gasoline Condenser

for condensing natural gasoline vapors in casinghead gasoline plants. Can also be used as a knockout box or fractionating tower control section with particularly close control of the end points.

Griscom-Russell Heat Transfer Apparatus

Banroc's *NEWEST* Cost Reducer

THE demand for insulation of higher efficiency and lower cost has been met so completely by BANROC that it is now used in four out of every five refineries in the country.

—Banroc meets this two-way demand perfectly—highest efficiency—yet lowest cost.

And now comes Banroc's newest cost reducer—BANROC METAL COVERED PIPE INSULATION—New—yet tested and approved by some of the largest refineries in the business.

We have a new bulletin that describes this wonderful new pipe insulation in detail. It will be sent on request. Write today.

BANROC
METAL COVERED PIPE INSULATION

BANNER ROCK PRODUCTS COMPANY
ALEXANDRIA, INDIANA

ORIGINATORS OF ROCK WOOL PRODUCTS

Three hundred knives!

Three hundred diamond-hard cutting edges, with a single concentrated aim—to cut, bite and tear scale out of your oil still tubes. This is the LIBERTY "S F" Cutter Head.

This head, backed up by the powerful LIBERTY motor, is bringing joy to the hearts of many refinery operators through its splendid ability in cutting a tough job short. The only thing to wear is the cutters—and these can be replaced with ease and speed, for the entire head comes apart with the removal of a single part—the head lock.

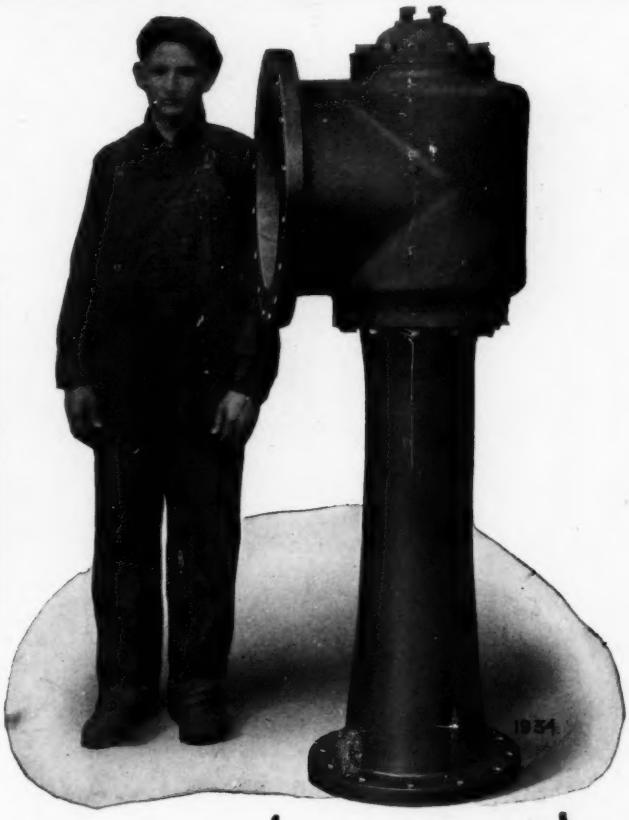
Keep your still tubes, cracking coils, boiler tubes, etc., as clean as a hound's tooth. A little periodical attention from a LIBERTY CLEANER will do it. Ask us for Catalog Z-2, covering the full line of LIBERTY CLEANERS.

Z-1055-a

Liberty Manufacturing Co.

Jeannette, Pa.

Vacuum Pumps Tested and Guaranteed



IT is difficult to make a satisfactory field test of a high vacuum pump. Delicate instruments for measuring vacuum are required. A difference of 1/10th inch in the vacuum reading at 29½ in. is a large difference in the absolute pressure, and may easily mean a — % difference in the steam consumption of the steam jet required to obtain the vacuum.

The Wheeler Condenser & Engineering Co. tests all steam jets before shipment. By agreement with purchasers, these tests may be witnessed at a cost covering only the additional time and expense incurred. If the purchaser is unable to be present, a witness test by a disinterested third party can be arranged.

WHEELER
CONDENSER & ENGINEERING CO.
Works, **CARTERET, N.J.**
and NEWBURGH, N.Y.
Main Office—149 Broadway, New York City

WHEELER
Oil Refinery Equipment

HEAT EXCHANGERS
(Liquid to Liquid)
VAPOR HEAT EXCHANGERS
FINAL CONDENSERS
VACUUM CONDENSERS
PARTIAL CONDENSERS
THERMO COMPRESSORS

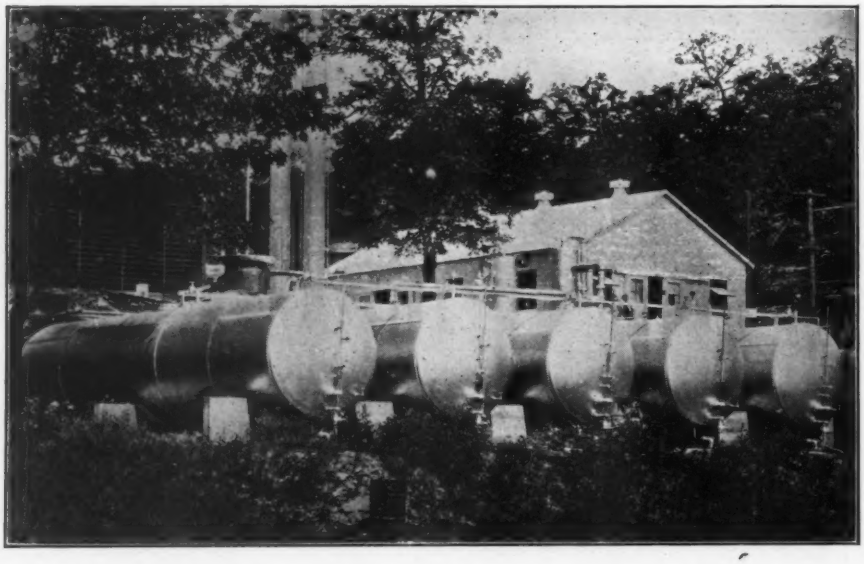
Other Products Include:

Cooling Towers,
Surface Condensers
Steam Jet Air Pumps,
Expansion Joints,
Heaters,
Evaporators,
Centrifugal Pumps,
Brass and Copper Tube and Pipe.

LOCAL OFFICES:

Birmingham	Philadelphia
Boston	Phoenix
Chicago	Pittsburgh
Cincinnati	Portland, Ore.
Cleveland	Salt Lake City
Dallas	Seattle
Denver	San Francisco
Kansas City, Mo.	Vancouver
New Orleans	Los Angeles

117



Charles Page Interests—Bruner Station nr. Sand Springs, Okla. Tanks, Bridges and Metal Buildings coated with Bitulumin.

"Southern Exposure" HARD ON PAINTS

Sun's Ultra Violet Rays Cause Rapid Surface Breakdown—

Aluminum Paints Largely Immune

Correctly made aluminum paints like Bitulumin are largely immune to destructive ultra violet rays. They will outlast the best oil and zinc paints by two to one.

Bitulumin forms a protective coating of tiny aluminum flakes like shingles held firmly together by its moisture proof liquid vehicle. It is both light proof and weather proof.

Because Bitulumin deflects approximately 86% of sun rays it makes for cooler surfaces and in the case of tanks reduces evaporation.

Bitulumin altho widely used for painting oil storage is equally efficient on tank cars, metal buildings, refinery equipment, still towers, water tanks, bridges, etc.

Bitulumin, put up in double containers to insure fresh mixing, is manufactured by Hill, Hubbell & Company, manufacturers of a special line of paints and protective coatings for the oil industry.

HILL, HUBBELL & COMPANY

Manufacturers of
Highest Grade Oil Industry Paints and Pipe Line Coatings

Factories at SAN FRANCISCO and TULSA

District Offices:

331 W. Eleventh St., LOS ANGELES
1006 Washington Ave., HOUSTON
15 Moore St., NEW YORK CITY
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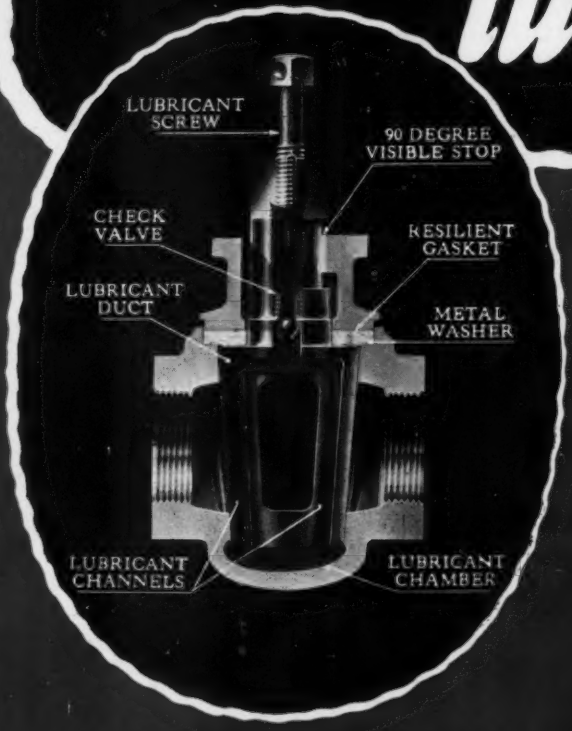
Mention Where You Saw the Advertisement

Why should a valve be lubricated?



WITHOUT proper lubrication the metal to metal surfaces within valves are subjected to direct wear, encouraging intrusion of foreign matter to the frictioning surfaces. In Merco Nordstrom Plug Valves a film of lubricant envelops the plug. This lubricant, under positive pressure, releases the plug against the compression of the gasket—and yet the plug is never separated from its seat sufficiently to allow entry of foreign matter.

Ask for Catalog.

Prominent Engineers recognize the superiority of these valves and are adapting them to countless services —on all types of oil lines, gasoline lines, gas and distribution lines, boilers, acid and caustic lines, steam and water lines, etc.

WON'T STICK! WON'T LEAK!

MERCO NORDSTROM VALVE CO.
SUBSIDIARY OF THE MARSHALL COMPANY

Engineers— *Manufacturers*

San Francisco, 121 Second St.
Chicago, Peoples Gas Building
Cleveland, Ohio, 325 Engineers Building
New York, 11 W. 42nd St.
Houston, 1113 Petroleum Bldg.
New Orleans, 1901 Masonic Temple Bldg.

Western Factory: Oakland, California
Eastern Factory: Belleville, New Jersey

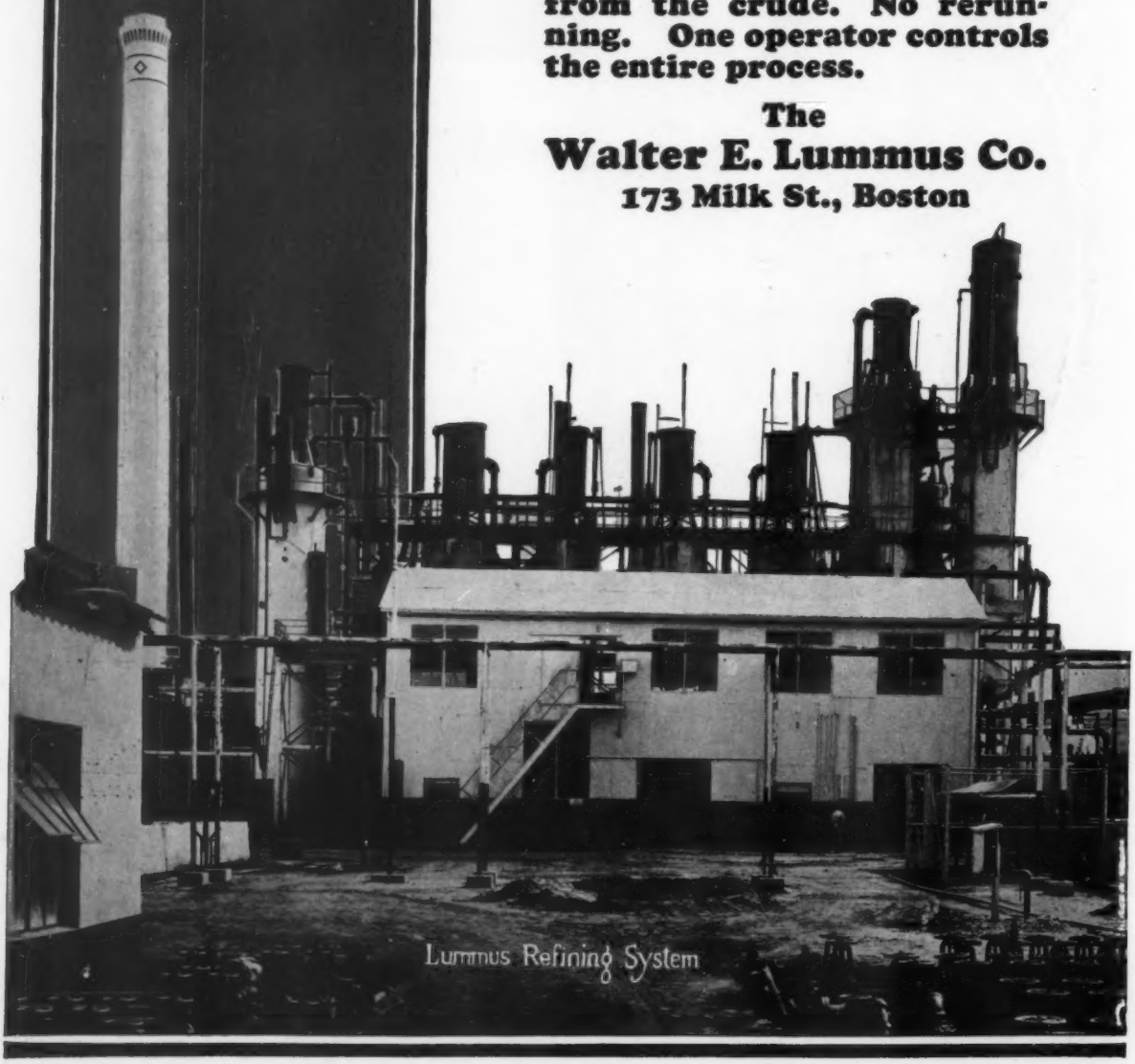
AGENCIES IN PRINCIPAL CITIES

Merco Nordstrom PLUG VALVES

LUMMUS
Low Temperature Refining System

PROVIDES the shortest path between crude oil and merchandisable products. All the gasoline, kerosene and distillates direct from the crude. No rerunning. One operator controls the entire process.

The Walter E. Lummus Co.
173 Milk St., Boston



Lummus Refining System

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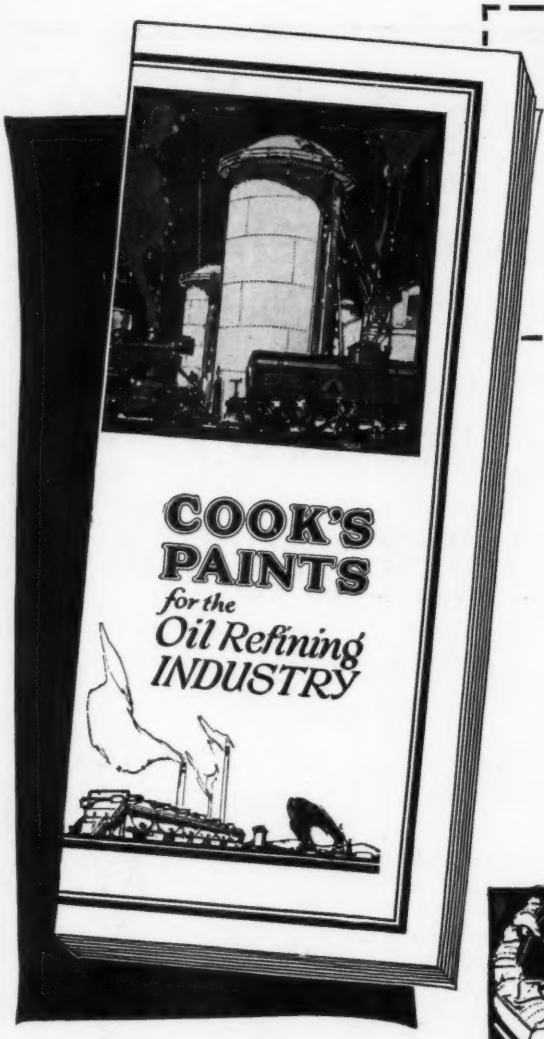


FREE! Your Copy of This Book
If you own oil refining equipment and are interested in its economical maintenance, you will find this booklet of value.

COOK PAINT & VARNISH COMPANY
Oil Industry Department, Kansas City, Missouri.
Gentlemen: Please send me without obligation your book of specialized paints for the Oil Refining Industry.

Company _____

Name _____

Address _____

STEEL-KOTE is one of the paints made by Cook's especially for use by the petroleum industry. It is recommended where extreme protective qualities and durability are desired. The highly basic pigments and special heat-treated oils used in its manufacture insure a tough, elastic paint film that will prevent rusting, pitting and corrosion.

Steel-Kote is economical and efficient because it is practical for either brush or spray application. It covers better and spreads farther than ordinary paints. It dries under all sorts of conditions. And it wears and wears and wears!

When repainting over old paint apply Cook's Steel-Kote direct. Unpainted metal surfaces require a priming coat for which we recommend Cook's Rust Inhibitive Primer.

STEEL-KOTE
for tank cars.

Cook's Service Men working out of our mid-continent branches are specialists on the subject of paints and painting for the oil industry. It is a pleasure to discuss your problems with you, and to recommend the particular type of paint you need. An inquiry involves no obligation on your part.

Cook Paint & Varnish Company

Factories: Kansas City—St. Louis—Fort Worth Houston—Cincinnati.

Branches: Chicago—Detroit—Omaha—Wichita—Oklahoma City—Tulsa—Dallas—Denver—Kansas City, Kas. St. Joseph, Mo.

Mention Where You Saw the Advertisement

The Holmes-Manley *Cracking* Process

Flexibility of Operation.

High Yield of Quality Gasoline direct from the Unit.

Fractionation and Condensation under Full Operating Pressure.

High Yield of Liquid Products with a minimum yield of fixed gas and carbon.

Low yield of Residue Fuel Oil of good Quality.

Relatively low Operating Temperatures.

Ease of Control.

Long Runs and High percentage of Operating Time.

Low Labor and Fuel Costs.

Address Inquiries to

THE TEXAS COMPANY

W. S. S. RODGERS

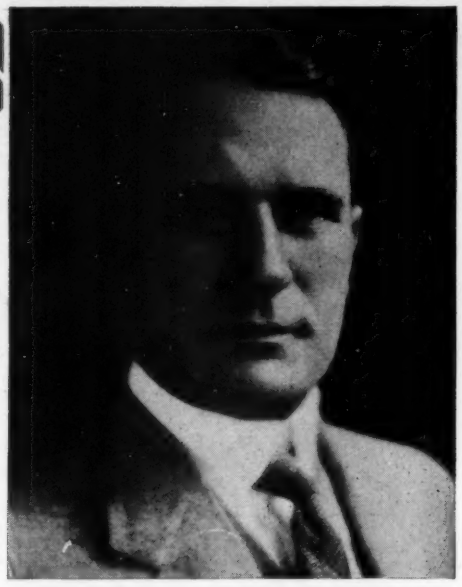
17 Battery Place, New York, N. Y.

Branch Office

816 Palace Building, Tulsa, Okla.

Mention Where You Saw the Advertisement

FOURTH INTERNATIONAL PETROLEUM EXPOSITION



JACOB FRANCE, President, Mid-Continent Petroleum Corporation Says:

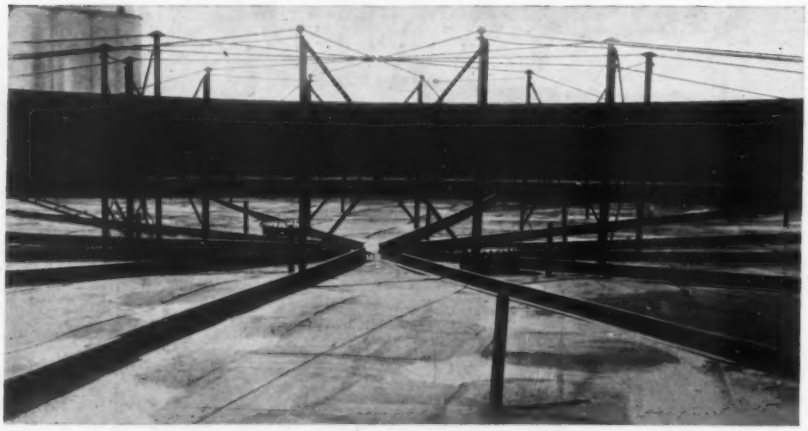
"Past Expositions have thoroughly sold us on the tremendous educational value of the Petroleum Exposition, and we plan to have all of our 'key men' in both production and refining divisions attend this year's show."

Jacob France

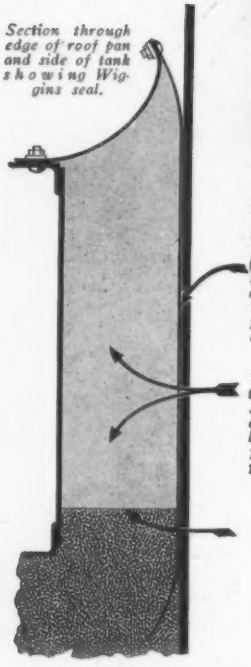
Early reservation of exhibition space at the World's Fair of the Oil Industry is advised, as more than sixty per cent of the space has already been contracted for. Desirable locations are still to be had, either in buildings or in the open air.

Your inquiry will bring plat of grounds and space, with full details, by return mail. Wire, phone or write INTERNATIONAL PETROLEUM EXPOSITION, J. Burr Gibbons, Gen. Mgr., 108 East Third St., Tulsa, Oklahoma, U. S. A. Phone 5605.

TULSA. SEPT. 24-OCT. 1



Close-up of Wiggins Roof showing construction of the floating pan which rides directly on the surface of the oil.



Section through edge of roof pan and side of tank showing Wiggins seal.

The deep, narrow slot of the Wiggins seal — the only oil surface ever exposed to evaporation. The depth of the slot causes this small surface to be blanketed with heavy vapor.

The sealed gastight vapor space. This seal discharges collected air, oil-free, to atmosphere through a vent.

The oil level line.

The "Ounce of Prevention" for Evaporation is a WIGGINS ROOF

COMPARED to an elaborate oil recovery system the annual cost (interest, depreciation and operation) of a Wiggins Roof is a small matter. And like the proverbial "ounce of prevention" it has big advantages.

No Evaporation

A Wiggins Roof floats right on the oil so that no evaporation can take place except over the narrow ring of oil between the edge of the floating pan and the edge of the tank. Ordinarily this space is covered by a gastight seal. When the roof shoes are traveling over rivet heads the deep narrow slot opens temporarily but even then the evaporation is practically nothing because windage is eliminated and the dense vapor at the bottom of the narrow slot protects the oil surface. Recent tests show a total evaporation with the Wiggins Roof less than one per cent of that with a gastight roof.

No Operating Expense

This saving in oil is made not only at a reasonable first cost but without a cent of operating expense. There are no pumps or compressors to run. The Wiggins Roof moves up and down with the oil level, automatically sealing in the oil and sealing out the air.

No Fire Hazard

Further, the saving is accomplished without fire hazard. In fact, the fire prevention provided by the Wiggins Roof is almost equal in importance to its evaporation prevention. The fire cannot reach the oil protected by a Wiggins Rcof.

Let us show you that it costs less to "prevent" evaporation on your tanks than to "cure" it.

This new booklet contains detailed descriptions and illustrations of the operation of the Wiggins Roof, and interesting data on the savings effected on rundown tanks, and standing and working storage. Your copy will be sent on request.

Chicago Bridge & Iron Works

Chicago, 2463 Old Colony Bldg.
New York, 3102 Hudson Terminal Bldg.
Cleveland, 2234 Union Trust Bldg.
Dallas, 1655 Dallas National Bank Bldg.
Atlanta, 1046 Healey Bldg.
San Francisco, 1051 Rialto Bldg.

R & N G M 8—Gray

WIGGINS ROOF

METALAYER

The "Putting on Tool"

—is now available for coating the inside of pipe, as illustrated above.

Briefly, METALAYER is a Process and Apparatus which applies (impacts) either in the shop or in the field, a coherent attached or separable coating of any commercial metal on any substance—whether inflammable, vitreous, fibrous, metallic, conducting or insulating—regardless of size, shape or location.

In the Oil Industry METALAYER offers *permanent protection from corrosion or chemical action.* With it molten metal coatings may be applied to either inside or outside surfaces of Storage Tanks, Tank Cars, Sweater Pans, Still Tubes, Structural Steel, Separators, Condensers, Agitator Tanks and Covers, Connecting lines of fractionating stills, etc., etc.

—and what's more, coatings of METALAYER "stay put"; in fact, they can be Turned, Drilled, Ground, Filed or Polished.

"Send for the METALAYER Book—it's gratis"

METALS COATING COMPANY OF AMERICA

CLEVELAND-CHICAGO

495-497 N. 3rd St.
Philadelphia

BERLIN-HAMBURG
LONDON-PRAGUE

SUNOCO

AUGUST

a pretty hot month to talk shop

BUT

Sunoco Absorption Oils 630 *and* 670

will give more time for that fishing!

WE will appreciate the opportunity of demonstrating just what Sunoco Absorption Oils 630 and 670 will do in YOUR plant. The number of plant owners using these oils now, keeps us running to capacity.

Ask our Engineering Department for samples. The benefit of its research work pertaining to Absorption Oils is yours. Our Engineers are ready to lend you assistance towards greater plant efficiency.

SUN COMPANY

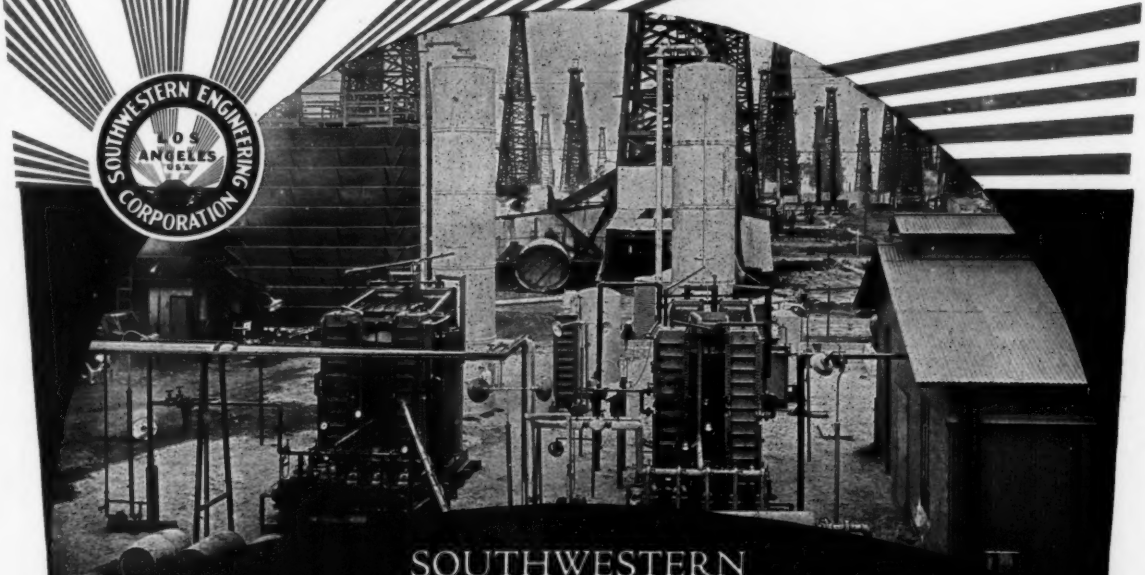
Petroleum Bldg., Tulsa, Oklahoma

Refineries at

Marcus Hook, Pa. Yale, Oklahoma Toledo, Ohio

SOUTHWESTERN PORTABLE AND FACTORY BUILT GASOLINE ABSORPTION PLANTS

SOUTHWESTERN ENGINEERING CORPORATION LOS ANGELES U.S.A.



SOUTHWESTERN
was the originator of portable and factory-built gasoline absorption plants and now offers complete units with gasoline capacity ranging from: 500 to 20,000 gallons per day.

Flexible Efficient Dependable.

SOUTHWESTERN ENGINEERING CORP.
1221 HOLLINGSWORTH BLDG.
Los Angeles, Calif.

Branch
Joplin National Bank Bldg.
Joplin, Missouri

and
90 WEST STREET, NEW YORK CITY

Branches
Western Bldg., Amarillo, Tex.
Mayo Bldg., Tulsa, Okla.

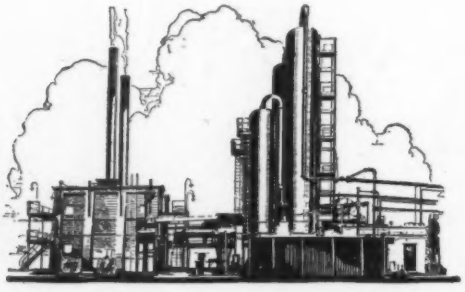
4803

K E L L O G G P I P E S T I L L S

A COMPLETE SERVICE
from design to operation

To the refiner who is contemplating the erection of pipe stills and fractionation towers, Kellogg offers a complete service.

A service combining engineering, design, manufacture, installation and operation—every step under the supervision and direction of engineers who are specialists in refinery practice.



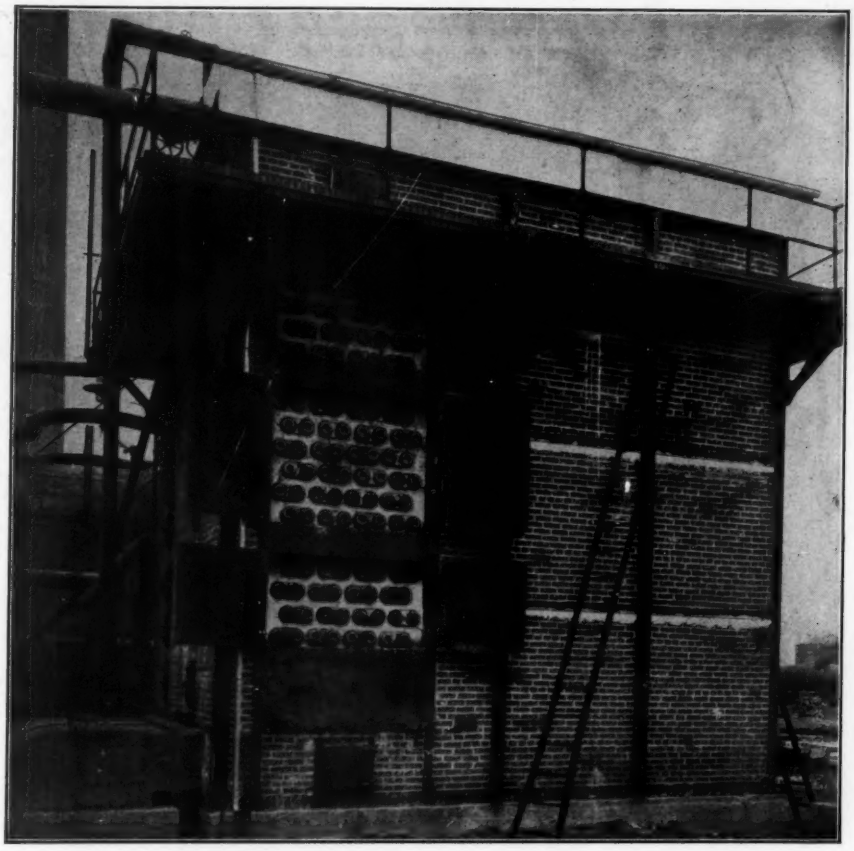
K E L L O G G

CROSS CRACKING PLANTS—BUBBLE TOWERS—PIPE STILLS—HEAT EXCHANGERS—GRAY TREATING TOWERS—TREATING PLANTS

THE M. W. KELLOGG CO., 7 DEY STREET — NEW YORK

KANSAS CITY, MO., 700 BALTIMORE AVE. — SAN FRANCISCO, CAL., 444 MARKET ST.
LOS ANGELES, CAL., 1019 HELLMAN BANK BLDG.

Mention Where You Saw the Advertisement



On every heating service

OVER 500 Foster Tube Stills are operating with a high degree of efficiency in topping crude oil, re-running distillates, recovering light oils, continuous distillation, distilling crude coal tar, cracking, producing lubricating stock, preheating cooling oil vapor, heating asphalt, refining vegetable oils, and many other industrial oil heating operations.

POWER SPECIALTY COMPANY
111 Broadway, New York
Branches in all Oil Centers

FOSTER
The TUBE STILLS
with the protected surface

Mention Where You Saw the Advertisement

Can these Companies all be Wrong?

Year in and year out leading oil companies the world over continue to order and re-order Oceco Equipment, and "you can't fool all the people all the time".

Among Oceco Users Are:

Associated Oil Co.
Atlantic Refining Co.
Barber Asphalt Co.
Barnsdall Refining Co.
Beacon Oil Co.
Bedford Petroleum Co.
Buckeye Pipe Line Co.
Calpet Refining Co.
Canfield Oil Co.
Carter Oil Co.
Cities Service Refining Co.
Cosden Pipe Line Co.
Crew-Levick Co.
Cumberland Pipe Line Co.
Henry L. Doherty Co.
Empire Refineries, Inc.
Ford Motor Co.
Great Southern Refining Co.
Gulf Refining Co.
Humphreys Pure Oil Co.
Humble Oil & Refining Co.
International Petroleum Co.
Invincible Oil Co.
Lago Oil & Transport Co., Ltd.
Louisiana Oil Refining Corp.
Lubrite Refining Co.
Marland Refining Co.
Mexican Petroleum Corp.
National Refining Co.
Paragon Refining Co.
Pan-American Petroleum & Transport Co.
Phillips Petroleum Co.
Phoenix Oil Co., Ltd.
Pierce Petroleum Co.
Pure Oil Co.
Roumania Consolidated Oil Fields, Ltd.
Roxana Petroleum Co.
Russian Soviet Government.
Shell Oil Co.
Sinclair Refining Co.
Society Romano Americana
Southern Pacific Co.
South Penn Oil Co.
Standard Oil Co. of Indiana
Standard Oil Co. of Kentucky
Standard Oil Co. of Louisiana
Standard Oil Co. of New Jersey
Standard Oil Co. of Ohio
Sun Oil Co.
Texas Company
Texas Pacific Coal & Oil Co.
Tidal Refining Co.
Tidewater Oil Co.
Transcontinental Oil Co.
U. S. Steel Corp.
Utah Oil Refining Co.
Vacuum Oil Co.
White Eagle Oil & Refining Co.
Argentine Government Refinery & Oil Fields

THE OIL CONSERVATION ENGINEERING COMPANY

Headquarters for Tank Equipment:
877 Addison Road, Cleveland, Ohio

Engineering and Sales Service at:
25 Broadway, New York
417½ So. Boulder St., Tulsa, Okla.
O-S Building, Casper, Wyo.
Box 552, Beaumont, Texas
Neilan, Schumacher & Co., Los Angeles, Cal.

"OCECO"

EQUIPMENT WITH A SERVICE RECORD

Mention Where You Saw the Advertisement

REFINERY EQUIPMENT AS YOU WANT IT

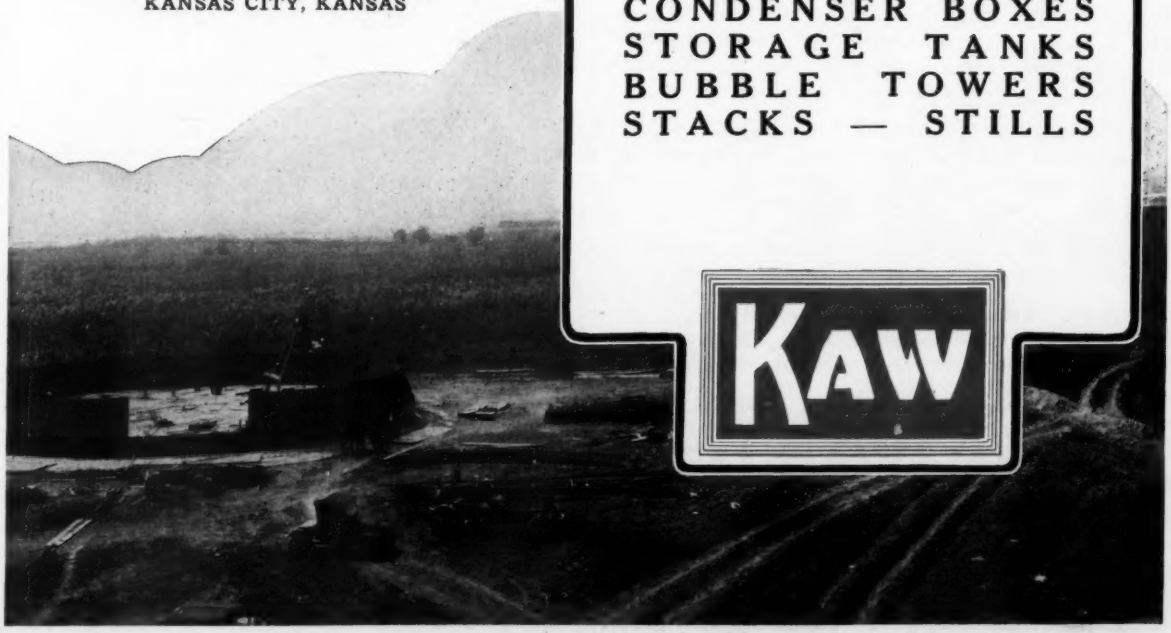
When you want refinery equipment quick, wire us. Regardless of whether you want standard equipment or special specification job, we assure you the speediest possible delivery. And every KAW product is better built for longer service.

Years Of Money Saving Service—

The many batteries of KAW - Built tanks giving year after year of trouble-free service at lowest possible maintenance cost are your proof that KAW can save **you** money.

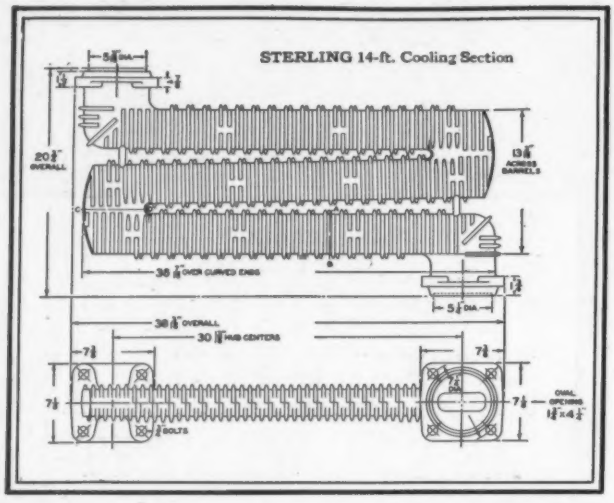
KAW STEEL CONSTRUCTION CO.
Gen. Office and Plant: 1st and Walker Ave.
KANSAS CITY, KANSAS

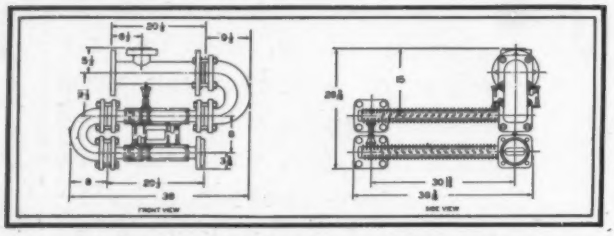
HORIZONTAL TANKS
RUNDOWN TANKS
CONDENSER BOXES
STORAGE TANKS
BUBBLE TOWERS
STACKS — STILLS



Mention Where You Saw the Advertisement

STERLING





Assembly of STERLING 14-ft. Cooling Sections, with header and return bend.

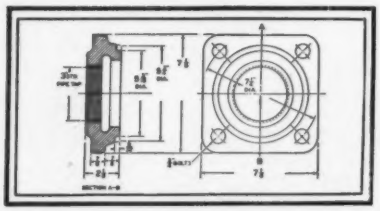
NEW STERLING

14-Foot Cooling Section and Accessories

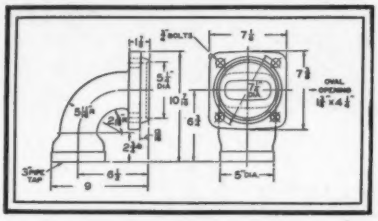
A *new* Section—designed to give more effective cooling on liquids where the volume is small, such as intermediate coils, or where a separation is made in the stream. Also a Section for cooling towers, for gasoline absorption and gas cooling plants for oil, gasoline and jacket water cooling.

This Section has the space-saving feature the same as our other Sections; is rugged in construction; made of ARCO Metal, which resists corrosion. Can be turned in the box to increase its life.

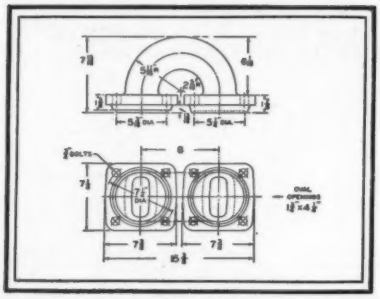
The 14-ft. STERLING Cooling Section can be used in connection with either the 19½-ft. Cooling Section or with the 14-ft. Condensing Section. A full line of fittings for assembling the sections as a unit or in connection with the 14-ft. condensing or the 19½-ft. Cooling Sections is made, thus retaining an ARCO METAL assembly from above the water line to the box outlet. Please send for catalogue.



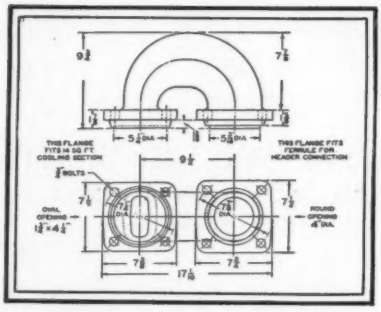
Flange—3" Pipe Tap



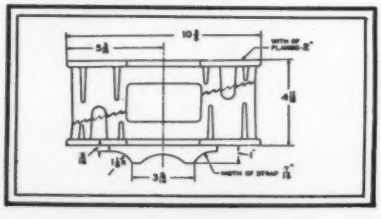
Elbow



Return Bend



Reducing Return Bend



Spacing Blocks

Accessories for new 14-ft. Cooling Section. All made of special ARCO Metal (corrosion resisting).

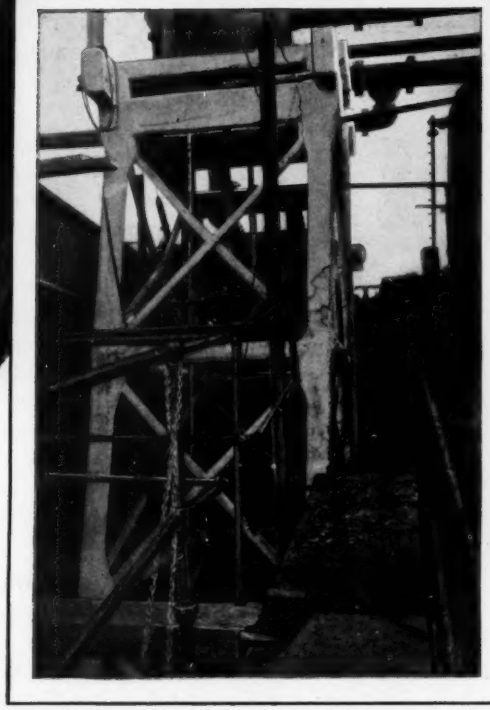
AMERICAN RADIATOR COMPANY

Industrial Division No. D

40 West 40th Street NEW YORK | 903 South Michigan Avenue CHICAGO | 935 Kennedy Bldg. TULSA | 1214 Quinby Bldg. LOS ANGELES

Structural steel fireproofing

Saved the Towers



Showing how the towers and Johns-Manville fire-proofing looked after the fire.

THE theory of Johns-Manville structural steel fire-proofing turned into fact when a 4-inch charging line pulled out of a still at the Hercules Gasoline Company, Los Angeles, California, and dropped the contents into the pit between still and condenser tanks.

The fire lasted 2½ hours. In the pit were three towers fire-proofed by Johns-Manville, holding vapor lines and dephlegmators. They did not buckle—as photograph shows.

Towers and dephlegmators were saved—not to mention the adjacent equipment that probably would have been destroyed as the result of their failure. We know of no better evidence of the value of this protection.

Through Asbestos and its allied products
INSULATION
BRAKE LININGS
ROOFINGS
PACKINGS
CEMENTS
FIRE PREVENTION PRODUCTS

JOHNS-MANVILLE

Oil Industry Department

JOHNS-MANVILLE CORPORATION, MADISON AVENUE AT 41st STREET, NEW YORK CITY
BRANCHES IN ALL LARGE CITIES. FOR CANADA: CANADIAN JOHNS-MANVILLE CO., LTD., TORONTO

Mention Where You Saw the Advertisement

STOP PIPE CORROSION
IN SMALL LINES

Our Simplex Prepared Joint Cast Iron Pipe is made in 2″, 3″, 4″ or 6″ diameters. Since it has been available thousands and thousands of feet of this material has been used in the oil fields.

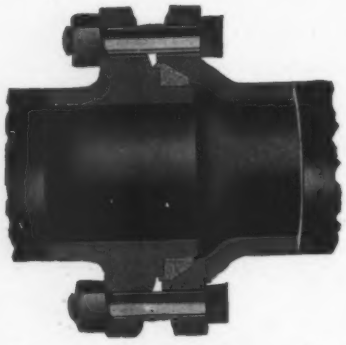


Illustration of section through assembled joint of Simplex Prepared Joint Five-Foot pipe, showing asbestos endless ring gasket in place. This gasket is adapted to use for oil, vapor and acid lines. A rubber gasket is compounded to suit the particular service it is to render—steam, natural gas, artificial gas, water, oil, etc.

Its chief advantage lies in its immunity from corrosion as compared with other ferrous pipe. Its desirability is further increased by the special joint, with only two bolts, and with a thick, endless ring gasket. It is rapidly and easily laid by inexperienced men.

Wherever permanent construction is desired, it is little short of an economic crime to spend money for a pipe line of perishable material when a practically permanent construction can be obtained by the use of cast iron.

Do you know why cast iron withstands corrosion so much better than any other ferrous metal? Our Bulletin No. 44 explains it.

Simplex Prepared Joint Pipe is furnished with full line of fittings. The material is fully described and illustrated in our Catalog No. 48. Your copy is waiting to be mailed, upon receipt of your request.

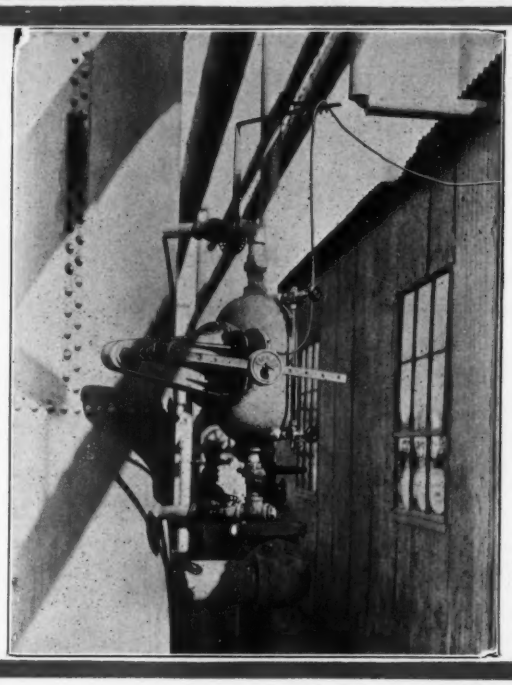
American Cast Iron Pipe Company

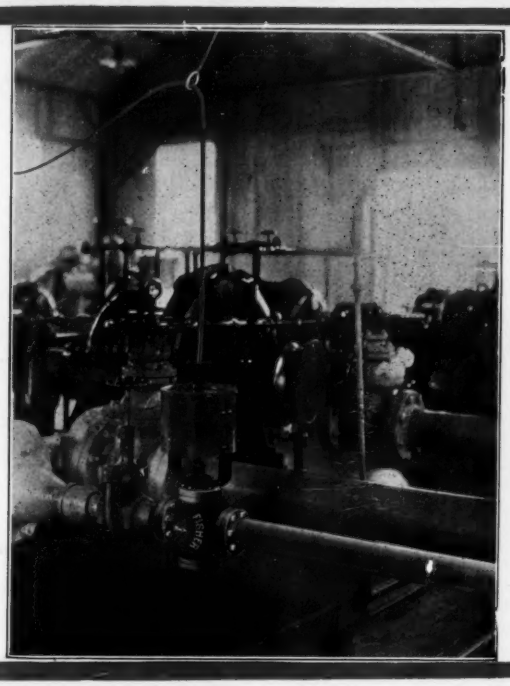
General Offices and Foundry: Birmingham, Ala.

Branches at
Dallas, Kansas City, San Francisco, Los Angeles, Chicago, New York, Minneapolis

Write Also for Information on Our
Simplex Cast Iron Pipe for Oil Condensers

FISHER
TRADE MARK REGISTERED





LIQUID LEVEL REMOTE CONTROL

Another installation of a Fisher Liquid Level Remote Control is here shown in the Carter Plant, Cromwell, Oklahoma.

In the case above, the float cage is installed outside the pump house on a tank, while the valve is located inside the pump house on a discharge line of a centrifugal pump. The float cage and the valve are 30 feet apart; in some installations there is a distance between the float cage and the valve of over 80 feet.

In this controller we use the regular cage of the Type 227A to which is attached a unique liquid transmission device, having a metal bellows on each end of a sealed transmission tubing. One bellows is installed on the cage and is actuated by the raising and the lowering of the float. The other end is mounted on the valve and the bellows is connected to the valve stem, directly transmitting the action of the float to the inner valve.

FISHER
TRADE MARK REGISTERED

Type 240, is the only device of its kind sold to the Oil Industry. Think of the advantages of this equipment —to be able to control any pump or like installation at a distance.

These remote control devices are being extensively used and are giving most satisfactory service on each installation.

THE FISHER GOVERNOR COMPANY

396 Fisher Building

Marshalltown, Iowa, U. S. A.

Ask us for complete circular describing Type 240 Fisher Liquid Level Remote Control.

Mention Where You Saw the Advertisement

HOPE VERTICAL COMPRESSORS

"The Modern Gas Compressor for the Modern Plant" is fully described in Bulletin 1601, giving details of design and construction, with complete specifications. Use the coupon below to secure your copy.

Bulletin 1601

The Coupon

Name _____

Mailing Address _____

City _____ State _____

Company _____

HOPE
ENGINEERING AND SUPPLY
COMPANY
MOUNT VERNON, OHIO, U.S.A.
DALLAS, TEX. TULSA, OKLA. CASPER, WYO.

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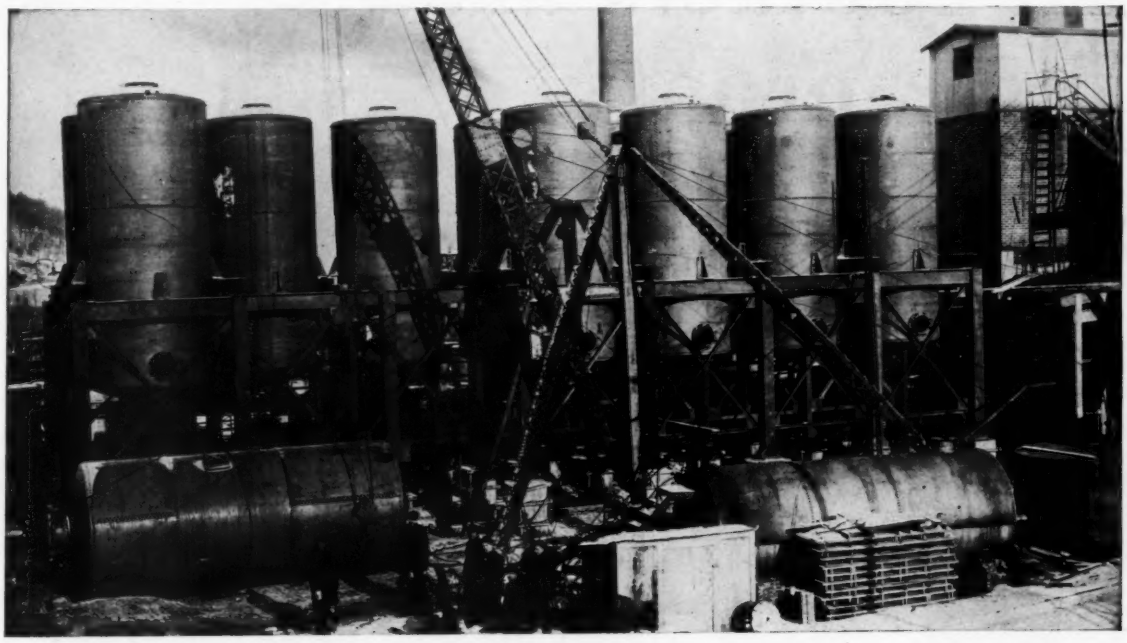


Hammond Filters with Fulton Patented Heads with Removable Non-Corrosive Monel Metal Screen. A Labor Saver doing away with old fashioned methods. Made in Diameters 5 to 10 feet and heights 10 x 30 feet. Names of users on request.

Our Bulletin No. 300 describes these Filters.

Our Bulletin No. 200 covers storage tanks from 300 to 80,000 barrels, and Bulletin No. 100R covers Horizontal Tanks from 1600 to 24,000 gallons. We make a specialty of furnishing steel tanks knocked down for domestic or export.

Erection men always available.

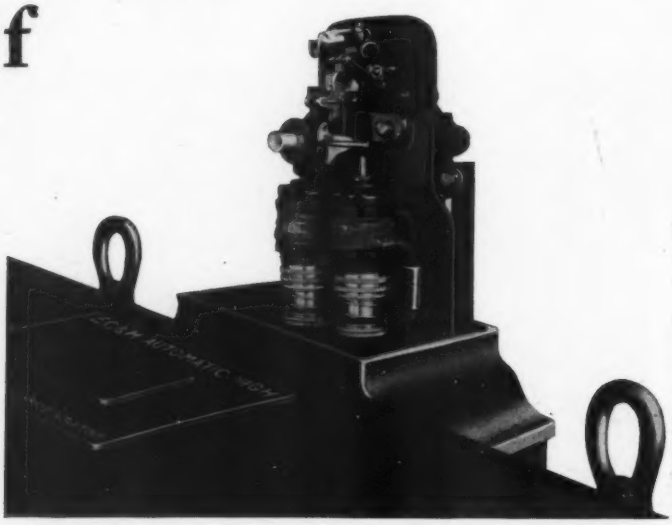
HAMMOND IRON WORKS

WARREN, PA.

Manufacturers and Exporters of Steel Tanks and Steel Plate Construction

(New York Office: 17 Battery Place—Telephone 0060)

All contacts are flame-proof



Hand compensators for starting A. C. motors are not flame proof. Main contacts are under oil but overload relay contacts and stop button contacts are ***not.***

EC&M automatic compensators, built for the oil industry, are 100% flame proof. Main contacts are under oil. Overload relay contacts are of the mercury tube type and make and break in a vacuum. The master switch for starting and stopping may be vapor proof or oil immersed as specified.

EC&M builds a complete line of oil immersed, flame proof starting equipment for the oil industry to control squirrel cage, slip ring and synchronous motors.

See Our Exhibit at the International Petroleum Exposition, Tulsa, Okla., Sept. 24th to Oct. 1st.

Bulletins 1042-F, 1047 and 1048 sent on request.

THE ELECTRIC CONTROLLER & MFG. CO.

NEW YORK-50 CHURCH ST. CLEVELAND, OHIO PHILADELPHIA-WITHERSPOON BLDG.
CHICAGO-CONWAY BLDG. MONTREAL-DRUMMOND BLDG. PITTSBURGH-OLIVER BLDG.
DETROIT-DIME BANK BLDG. LOS ANGELES-AMERICAN BANK BLDG. SAN FRANCISCO-CALL BUILDING
BIRMINGHAM-BROWN-MARX BLDG. SALT LAKE CITY-228 W. SO. TEMPLE SEATTLE-570 COLMAN BLDG.
CINCINNATI-PROVIDENT BANK BLDG. TORONTO-REFORD BLDG. TULSA-217 E. ARCHER ST.

Mention Where You Saw the Advertisement

For Strength, Safety and Economy Use

SEAMLESS

SEAMLESS steel tubes are greatly superior to welded pipe for all of the severe uses to which tubular steel goods are subjected in the production and refining of oil. The seamless process surmounts the limitations of the welding process, permitting the use of better, stronger steel. Practically any physical and chemical properties desired may be obtained in seamless steel tubes. Moreover, "seamless" has uniform strength whereas every inch of weld in a welded pipe is a point of potential failure. Where strength and safety are considerations the use of "seamless" is indispensable.

"Pittsburgh Seamless"

Boiler Tubes Still Tubes Line Pipe
Refinery and Power Plant Piping

FOR more than twenty years our entire research and manufacturing activities have been devoted to "seamless", and we are today the largest manufacturers of seamless steel tubes exclusively. "Pittsburgh Seamless" Steel Tubes are giving eminent satisfaction for boiler work, cracking stills and all high pressure piping around refineries and power plants. We also make a superior line of Oil Well Tubing, Drill Pipe, Casing and Line Pipe.

Pipe Storage Yard at Memphis

Prompt delivery service is assured by our large pipe yard storage stocks at Memphis, and warehouse stocks at other convenient points. Specify "Pittsburgh Seamless" for all of your tubular steel requirements.

Pittsburgh Steel Products Co.

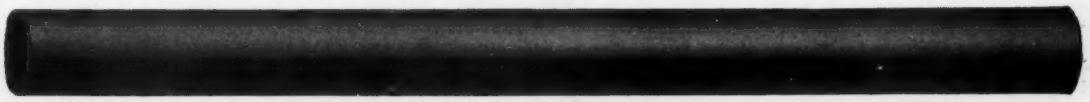
PITTSBURGH, PA.

1610 Second National Bank Bldg., Houston

306 Atlas Life Bldg., Tulsa.

NEW YORK CHICAGO

DETROIT



BUCK

"The Only Regulator that actually Regulates over its entire capacity range"

THE General Superintendent of one of the most prominent natural gasoline producing companies made this remark.

He was watching a Buck 6-inch Casinghead Regulator make a perfect chart while passing but 1,500 cubic feet per hour, and maintaining 20 inches mercury vacuum at intake.

Such accurate regulation on but 1½ per cent of actual capacity is characteristic of all Buck Regulators. This accurate regulation—from wide open at full capacity down to the valve all but closed—is characteristic solely of the Buck Sleeve Valve principle.

That is because the Buck Sleeve Valve is scientifically correct in design—fully balanced, statically and dynamically, in any position—and immediately sensitive to the slightest pressure change. There is no chattering—dashpots are not needed.

The capacity of Buck Regulators is surprisingly large. There is the least possible resistance to flow of gas. Capacity of pipe lines is utilized to the utmost. The large capacity of Buck Regulators—their constant regulation of any proportion of volume passing—their highest sensitivity with simplest construction—are producing remarkable results and pleasing economies for many companies that are standardizing on Buck Equipment—just as the company whose superintendent made the above statement.

Bulletins on Request

G-B MFG. CO. KANSAS CITY, MO.

BUCK OIL CONSERVATION EQUIPMENT

Type A Sensitive Regulators
Casing Head Regulators
Liquid Level Controllers
Tank Valves and Equipment
Oil and Gas Separators
Oil Field Supplies

BELTING
Rubber Canvas
Leather Cotton
Balata

HOSE
Air Fire
Oil Steam
Water

PACKING
Asbestos Hemp
Flax Rubber
Leather

GASKETS
Rubber Asbestos
Leather Fiber

WASTE
White Colored
Wool

MISC'L
Matting Drills
Pulleys Picks
Shovels

Gustin-Bacon Mfg. Co.

Vacuum Control Division

Kansas City, Mo. Tulsa, Oklahoma

JENKINS CRACKING PROCESS

Facts from performance

Almost any refining method will make money for the refiner in a seller's market. But it requires real operating economy and a high quality product for profitable operation in a market with narrow margins.

Jenkins Licensees have advantageously operated their Units thru every market condition, including the present one.

GRAVER *Founded 1857* *Corporation*

EAST CHICAGO, INDIANA

NEW YORK Grand Cent. Term. | CHICAGO Steger Building | TULSA Atlas Life Bldg. | HOUSTON West Building

Any office can give you complete information

Of Course, Laclede-Christy Flat Arches Give Longer Service!

CONTRACTS SUBJECT TO CAUSES BEYOND OUR CONTROL

CIRCLE CORPORATION, INC.

MECHANICAL ENGINEERS, POWER OUTFITTERS, SUPPLIES, FOR OIL AND GAS, MINES, RAILROADS, CONTRACTORS, MILLS, INDUSTRIAL AND MUNICIPAL PLANTS.

Fifth Floor Central National Bank Building

PHONE 9432

P. O. BOX 1224

TULSA, OKLAHOMA

ASSOC. OF AM. SOC. M. E.

April 3, 1927

Laclede-Christy Clay Products Co.,
St. Louis, Missouri

Att: Flat Arch Division

Gentlemen:

When in [redacted] last week, I made a service call at [redacted] Refineries and had a fine opportunity to inspect their flat arches. It just happened that the large pipe still having their first Laclede-Christy Arch was down for repairs so I could get into the furnace with their engineer and inspect the arch.

Although this arch has been in almost continuous service for three or four years, we did not find a single cracked or broken tile; in fact, the arch looked as good as new. Then we looked at their other Laclede Arches under fire inspecting them through peep holes only, and all were perfect as far as we could see.

We then came to a still having an arch that was very badly spalled with large chunks of tile out and with whole tile out in several places. I was surprised at first, but when I climbed on top of the still I found it was not a Laclede but [redacted] arch. This gave me another fine opportunity to explain how the Laclede bolted construction spaces the tile to provide room for expansion and it certainly does make the tile last longer.

Needless to say, this company will never buy another [redacted] arch, or any other arch with a lot of loose parts. They are real Laclede-Christy boosters and you can refer any one to them.

Yours very truly,
CIRCLE CORPORATION, INC.
W. L. Sullivan
W. L. Sullivan, Mgr.

WLS-r

Mention Where You Saw the Advertisement

CAMPBELL BUBBLES *Void the Voids*

The Campbell theory of tiny bubbles—billions of them — has proven correct by performance of every Campbell installation. In place of large bubbles, the area within a Campbell Oil - Froth Absorber is filled with tiny bubbles, rubbing against one another, contorting, elongating, breaking and remaking —thus effecting intimate contact of gas with the film upon each bubble. Thorough absorption is the result.

Descriptive literature upon request.

J. A. Campbell

Consulting—Designing—Constructing

Natural Gas Engineer

P. O. Box 669 LONG BEACH, CALIF.

CAMPBELL

OIL FROTH

absorber

Mention Where You Saw the Advertisement

OIL METERS

for

CRACKING PROCESSES

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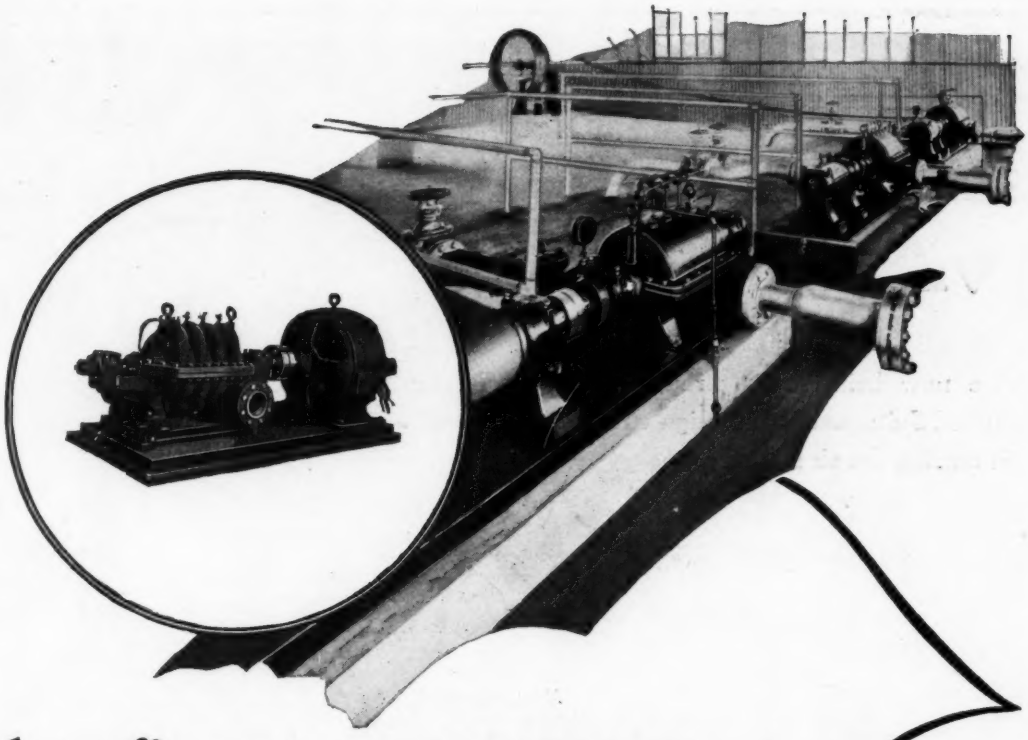

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The petroleum industry requires practically every type of pump—oil line pumps, gathering pumps, water pumps, and the numerous types used in refining processes. Goulds Pumps are made in a wide variety of types, each one of proven dependability. They are used in large numbers for field, refinery and gasoline plant service.

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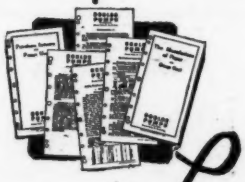
Engineers and executives in all phases of the oil industry can get specialized assistance in pumping problems from Goulds engineers.



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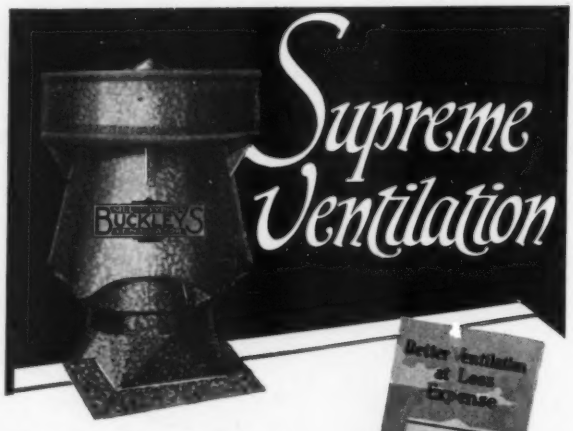

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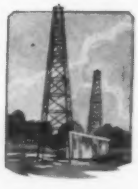

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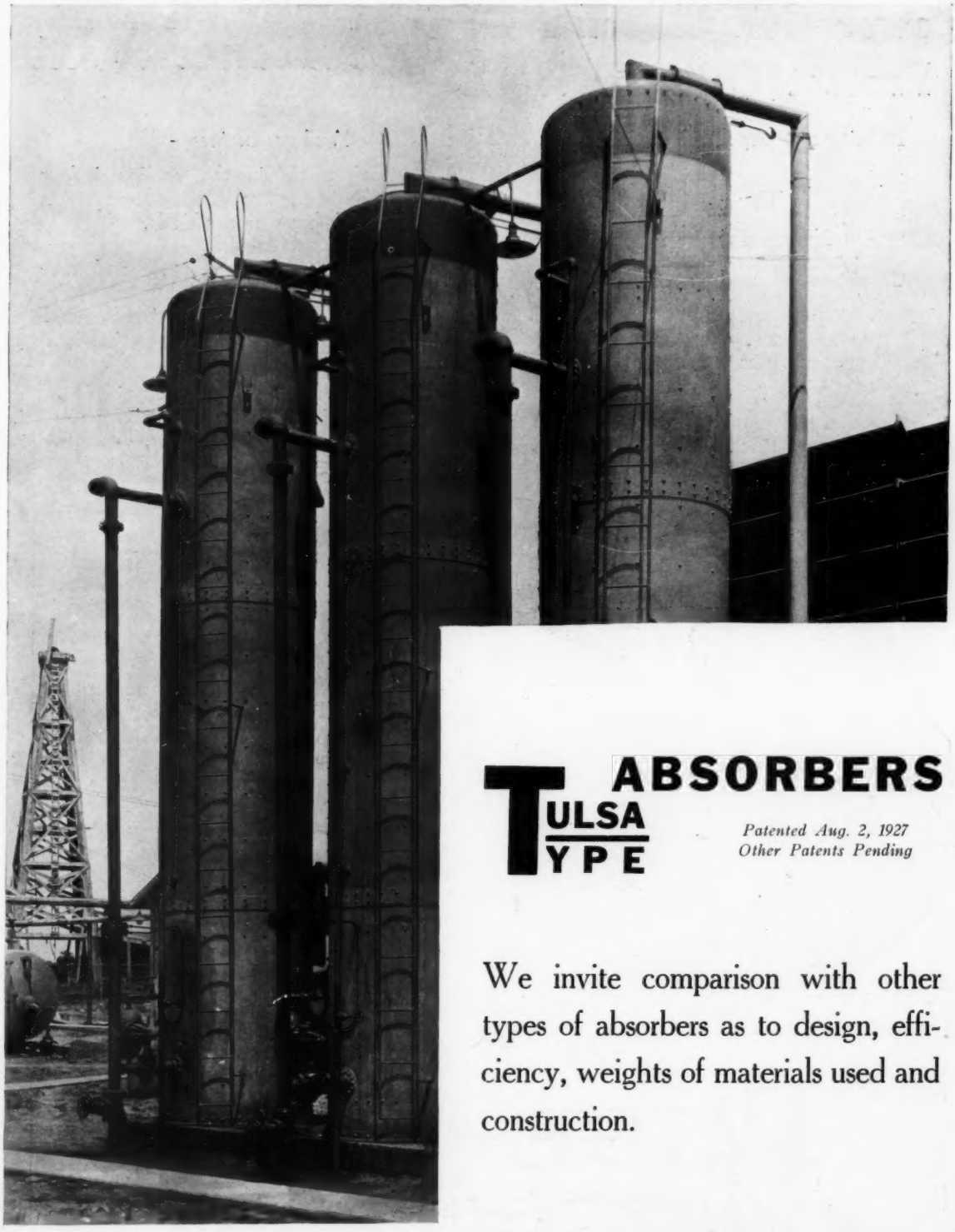

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Improve Condensation Lower Coil Cleaning Costs Protect Cylinder Heads

By Using Softened Water

Refining costs are still figured in cents.

Progressive companies constantly strive to lop off a cent here and a cent there from the cost of producing gasoline.

Consider condensing systems—

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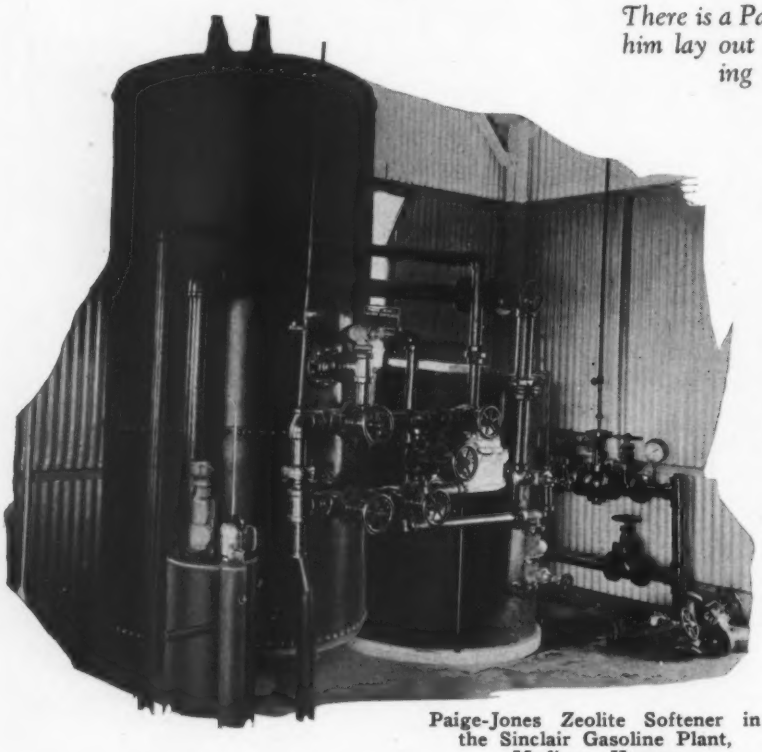

Paige-Jones Zeolite Softener in the Sinclair Gasoline Plant, Madison, Kansas

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ZEOLITE AND LIME SODA SOFTENERS · PRESSURE SAND FILTERS
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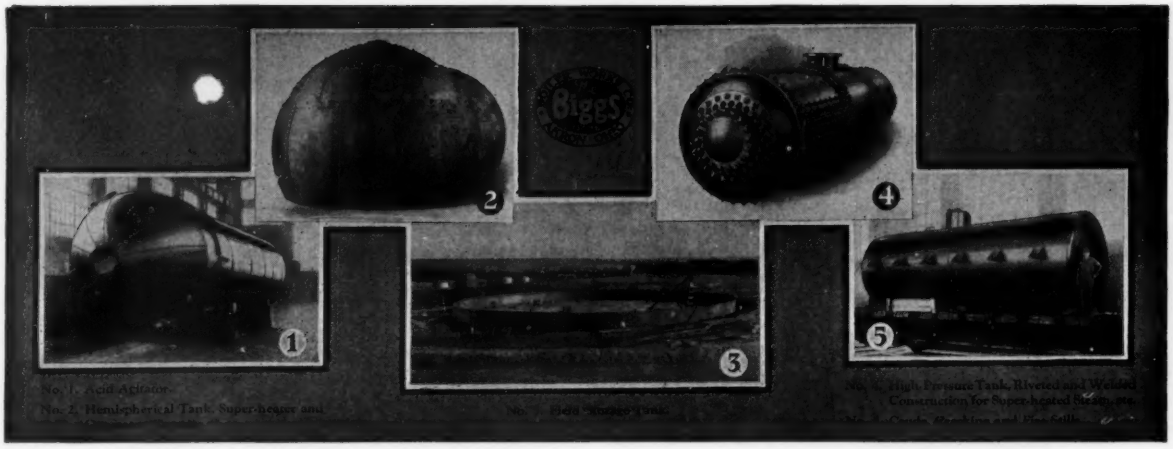

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You Can Rely on Biggs for Every Kind of Heavy Steel Plate Construction

The Biggs Boiler Works Company is ideally equipped to handle all major requirements of the oil industry promptly and efficiently.

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From field storage, acid, run down and blending tanks to fractionating, dephlegmating and bubble towers, condenser boxes and stills, "Built by Biggs" means made right, always tight with a generous measure of accuracy and economy as well.

Biggs fabricates and erects a complete line of steel plate work up to 1½ inches in thickness.

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TANKS AND GENERAL
STEEL PLATE WORK
for the Oil Industry

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Without this force the greatest sales organization in the world will stand defeated after a time. High purposes and strong endeavor will be of little avail to offset its lack.

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Where work is done to specification there is even more need to know that what is planned in the office will be carried through in the shop.

Wyatt men, whether working in the shops at Dallas or putting in an installation at the customer's plant have the ability to perform. It is a trait of coming through which has been developed as a sort of inside morale of the Wyatt organization.

Wyatt's, developing steadily with the Southwest and in touch with its leading industries, offers the facilities of a fully equipped and thoroughly adequate plant for the fabrication of steel and other metals.

Oil Tanks, Storage Tanks, Culverts, Smoke Stacks, Metal Products of all kinds.
Refineries complete.

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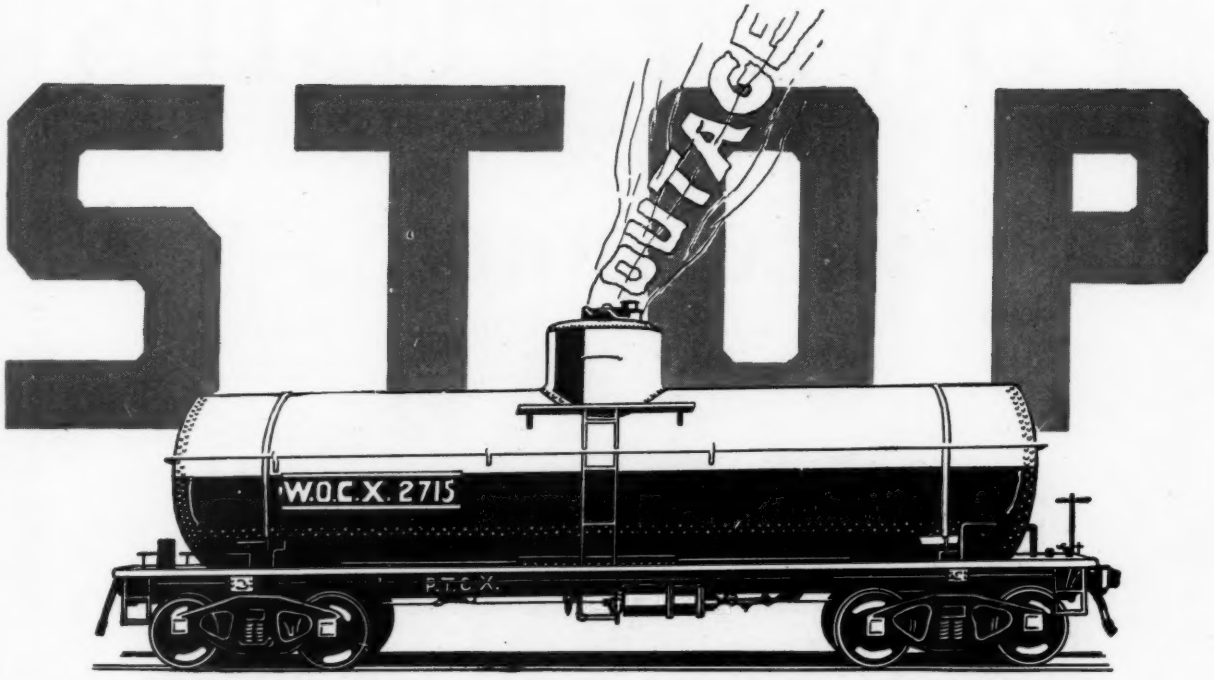

Evaporation losses in your shipped product can be stopped by making a *low vapor pressure, high recovery* product with a NEWTON Distillation Unit.

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Loaded tank car 10,000 gal.
Same car unloaded at destination . . . 9,000 gal.
Outage deducted 1,000 gal.
Loss taken on the manufacture of . . . 1,000 gal.
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Loss of profit on 1,000 gallons because it could not be sold. And all because the original product could not withstand shipment on account of vapor pressure. NEWTON Equipment will cut your losses to the minimum.

¶ NEWTON Blending Evaporators and Fractionators hold as a desirable product the most that absorbers can extract from gas. ¶ The saving effected will soon pay for the installation. ¶ This will surely interest you as a producer of natural gasoline. ¶ Ask for complete details.

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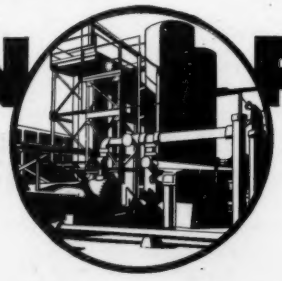

Known far and wide as the "Profit Process"

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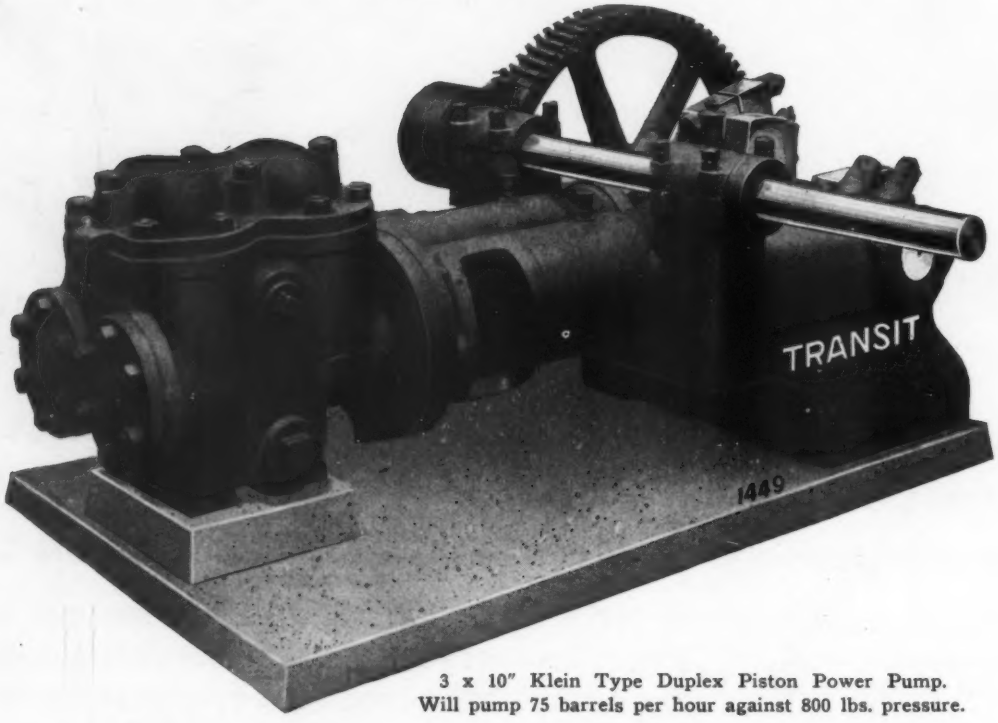

3 x 10" Klein Type Duplex Piston Power Pump.
Will pump 75 barrels per hour against 800 lbs. pressure.

The call for power pumps becomes more and more insistent as the oil business becomes highly competitive. Close attention is now being paid to power costs. In many places, especially in the oil industry, the cost of steam power is all out of proportion to the cost of power by oil or gas.

Above we illustrate an up-to-date power end coupled to an old reliable Klein Type fluid end. Every oil man knows the excellence of Klein Type pumps. The pump complete weighs little over a ton. It makes an ideal field pump, or an oil salvaging pump to mount on a truck. With a working pressure of 800 lbs., it is often used to pump oil direct into main lines.

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Bulletin 201-A describing the smaller sizes of TRANSIT Power Pumps gladly sent on request.

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Vol. 6, No. 8

AUGUST, 1927

The REFINER

AND NATURAL GASOLINE MANUFACTURER

Edited Monthly at Tulsa, Oklahoma

GRADY TRIPLETT, *Editor*

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Series 150—150 lbs. pressure at 750°
Series 300—300 lbs. pressure at 750°
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Series 600—600 lbs. pressure at 750°
Series 900—900 lbs. pressure at 750°

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REFINERY VALVES

Stainless steel in all vital parts

the gates, stem and valve seats—Stainless Steel is a metal trim that has found wide favor among many Kerotest Refinery Valve customers.

It is absolutely impervious against rust or corrosion and gives Kerotest Valves the dependable long-lasting service for which [illegible] the Refinery Industry.

However, if you prefer other kinds of valve trim such as monel bronze, nickel, chrome nickel, carbon steel, etc., Kerotests can be furnished to meet your exact requirements in all sizes and weights.

Write for the Kerotest Folder

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Besides Gasoline

TO the independent refiner, looking for a better market, there looms at every turn the greatest supply of raw material he ever has known. The total now is higher than the industry ever has seen and the prospect is for still higher totals of crude oil stocks.

The condition early in August points to some control at Seminole, commonly branded as the cause of the surplus crude oil supply. But the effort among Seminole producers is to hold Seminole's daily output to 450,000 barrels. It is not certain that this figure will be held. But even that high output is sufficient to keep the curve on the crude oil graph climbing.

This gigantic supply of raw material is the base from which each refiner must calculate his business methods for the remainder of the season of high gasoline consumption, as well as the coming winter months, when weather will bring gasoline consumption down. If a profit is to result from plant operation, it must be made while enough crude oil is available to hold prices below the profit-making line.

The growing crude oil total is a dark picture to the refiner. It means a low gasoline market. Even distillates are under the influence of too much crude oil.

There is no relief the refiner can provide for himself, so far as the raw material is concerned. It is coming because owners of leases are drilling wells in a rich oil section. While these operators are being criticised, they, too, face some conditions they can not alter.

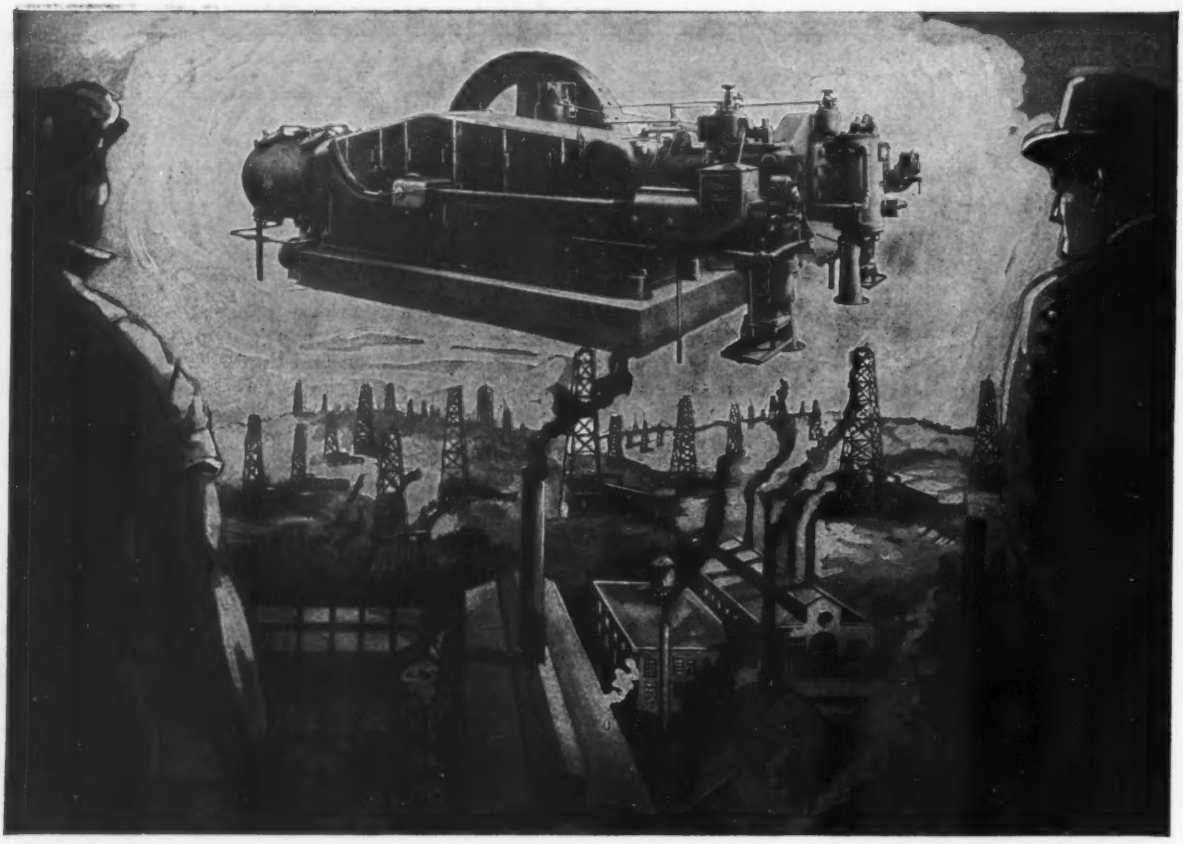
Any relief for the refiner will of necessity come from the way he conducts his business, looking all the while at an excessive crude oil figure. Some North Texas concerns already have turned from gasoline as the major plant output, depending largely on special naphthas and blending materials to supplant motor fuel.

This is one instance of refiners offering some solution to the condition of unprofitable gasoline, because of an excessive crude supply. But this instance can become of no value, if too many plants are turned to making identical products.

The present conditions of too much crude oil could serve a good purpose, should it teach men to look to markets other than the automobile to consume a substantial portion of plant output. Petroleum can be converted into so many finished products that the refiner has been little short of backward in delaying to open additional markets. Had this been done to the extent of its possibility in years past, it would have served to protect refiners in times of gasoline depression.

Only a few concerns have taken advantage of these wider markets over a period. In most instances these have been the larger concerns, having big plants. The smaller and usually the independent concerns have given it scant consideration. The impression has been that additional equipment would be necessary to the making of special products. Now some of these smaller concerns are learning, through necessity, that only changed operating methods, using existing equipment, is necessary.

While the huge surplus of crude oil exists, refiners can learn where to sell special products in small quantities but at prices assuring profit. That is just one benefit that may come from Greater Seminole and West Texas. They are a threat for a long period.



"Mr. Lewis and Joe Choose an Engine"

Mr. Lewis, superintendent of the gasoline department, and Joe Rolland, head engineer at the compressor station, look at an engine from slightly different viewpoints.

Mr. Lewis thinks of the balance sheet at the end of the year and how it may be affected by investment charge, maintenance costs, fuel consumption, lubricating oil consumption and last, will his choice ever cause his associates or friends to say: "Well, you will remember I advised buying a different engine."

Joe thinks in terms of the work required to keep the engine on the load day after day. Are adjustments easily made? Will there be frequent messy replacements to make? Will he ever need to defend his choice with his boss?

The steadily increasing sales record of Cooper engines and compressors is the surest indication that men in both positions prefer to play safe by choosing Coopers.

THE C. & G. COOPER COMPANY

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COOPER

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North Texas Refiners Specializing In Solvents and Naphthas

WITH the continued demand for solvents and painter's naphthas, many refiners in the North Texas area are turning their attention to the manufacture of these products and are receiving the benefit of a profitable price. Whereas a few months ago these products were given little consideration, the brisk demand for them, coupled with the slow movement of gasoline stocks, has created an interest in their manufacture generally throughout the refining industry. The price obtained through the manufacture of rubber solvents and naphthas has enabled a number of refineries to show a margin of profit although the manufacture of gasoline has barely met the cost of production. Generally the price obtained for these commodities has been from a half a cent to three quarters of a cent above the price posted for gasoline.

The percentage of plant recovery of all products has not suffered. In fact a greater recovery may result through the medium of deeper cuts and the proper blending of natural gasoline with the refined product from the crude stills or where the plant is equipped with cracking units the addition of the low boiling range fuels from these units. Several plants are running to "navy gasoline" with two grades of naphtha following, passing up the kerosene for a low gravity naphtha ranging from 46.0 to 48.0; the higher grade naphtha ranging in gravity from 48.0 to 50.0.

Among the refineries of North Texas specializing in these products is the Panhandle Refining Company with probably the largest production of these commodities. This plant is equipped with the Dubbs cracking system and the Cross pipe still in addition to its regular plant equipment of crude and rerun stills. This plant has for some time pioneered in the manufacture of petroleum products holding with the United States government over a period of years contracts for the supplying of airplane and motor gasolines. In the manufacture of special naphthas the crude stills are utilized, except the first two of the system, which are given up to the production of other products such as rubber solvent and navy gasoline.

The rubber solvent is a special product with specifications to suit the purchaser, generally ranging in gravity from 68.0 to 70.0, the initial boiling point approximately 100 degrees and the end point 320 to 340. The distillation range of this product may be quoted as:

IBP	100° F.
5%	128° F.
10%	144° F.
20%	164° F.
30%	180° F.
40%	196° F.
50%	214° F.
60%	226° F.
70%	244° F.
80%	270° F.
90%	306° F.
E. P.	340° F.
Gravity	68/69
Color	Plus 25 Saybolt
	Odor—Fair.
Doctor	Negative
	Dist. Loss 5%
	or Under.
Corrosion	Negative

In the manufacture of this product known as rubber solvent very little fire is used under the still, just enough heat to prevent the temperature from falling as the crude arrives from the heat exchangers and maintain the proper gravity, about 345 degrees F. with a velocity of 100 strokes per minute from the feed pump. Each of the towers is equipped with a spray in the top of the tower and each tower utilizes its own stream for a reflux. One of the remarkable characteristics of the rubber solvent product is the small loss through distillation and recovery. Chemical treatment of this product is also obtained at a very low cost, which may be expected of the product from the light ends of the crude which is a general mixture of the North Texas fields, ranging in gravity on an average from 36.0 to 38.0. The price obtained for this special product is generally around three-quarters of a cent above that of 64/66 export gasoline, and of course, allows for a greater margin of profit. In the crude still line-up, if it is desired, navy or export gasoline may be taken from Nos. 1 and 2 or the rubber solvent from No. 1 while No. 2 is used for the production of gasoline. The stills are equipped with short baffled rock packed towers, excepting No. 4 and No. 7, which are equipped with four by 40 foot bubbletowers, No. 5 crude still not being used in continuous operation excepting in case of emergency. All feed is directly into the stills other than that of No. 7 crude still, where the crude is fed into the tower approximately a third of the distance up. The pipe still and rerun stills are operated in conjunction with the gasoline from these units are blended with the crude still still gasoline in proportionate amounts.

In the manufacture of special naphthas no noteworthy change is made other than making deeper cuts on the kerosene ends and care in utilizing as much of the crude charge as possible without sacrificing quality in the products. In producing two grades of naphthas the gravity of the products is governed in a large measure by the overhead feed. A painter's naphtha with a gravity between 46.0 and 48.0 is removed from the still with a temperature approximating 545 degrees F. and the tower temperature around 410 degrees F. The distillation range on this particular product, which is demanded, is approximately as follows.

IBP	315° F.
5%	340° F.
10%	348° F.
20%	354° F.
30%	360° F.
40%	364° F.
50%	368° F.
60%	374° F.
70%	380° F.
80%	388° F.
90%	400° F.
E. P.	425° F.
Gravity	46/48
Color	Plus 25 Saybolt
Doctor	Negative
Corrosion	Negative
Odor	Fair
Dist. Loss	3% or Under

It may be remarked here that this particular product has always found a ready market, generally the consumer paying a premium above the posted price especially in the case of an extra quality painter's naphtha. In some instances the specifications on this naphtha has been below 300 or 284 degrees and above. In treating this naphtha generally a batch treatment with 16 Baume caustic soda avoiding the use of sulphur has been found sufficient for neutralization for corrosion and doctor, although in some instances it has been found necessary to use lead in varying amounts.

The special blender's naphtha is run for a gravity ranging from 48.0 to 50.0 with the end point 450 degrees F. or under. The still temperature is carried slightly higher with a slightly higher

(Continued on page 112)

Committees Shaping N. P. A. Anniversary Meeting

Warren, Pa.—Arrangements for the twenty-fifth annual meeting of the National Petroleum Association in Atlantic City, September 14, 15 and 16, are in the hands of committees named at the spring meeting at Cambridge Springs, Mass. Information from Howard H. Greene, chairman of the publicity committee, is that the twenty-fifth anniversary meeting will be a mark in the affairs of the association.

E. M. Lyons of the Tiona Refining Company, Clarendon, Pa., is general chairman of the Atlantic City convention. On this committee are also O. P. Keeney, general manager of the Tide Water Refining Company and president of the association; also Fayette B. Dow, general counsel of the organization.

Other committees are:

Program—P. S. Tarbox, Independent Refining Co., Oil City, Pa., chairman; M. F. Cowden, Pennsylvania Oil Products Refining Co., Eldred, Pa., Percy L. Craig, Freedom Oil Works, Freedom, Pa.; G. S. Davidson, Gulf Refining Co., Pittsburgh, Pa.; Dr. Frank Fritts, Indian Refining Co., Lawrenceville, Ill.; Frank C. Hart, Hartol Products Corp., Franklin, Pa.; James Lewis, Bradford Oil Refining Co., Bradford, Pa.; Frank F. Moore, McKean County Refining Co., Bradford, Pa.; J. Howard Pew, Sun Oil Co., Philadelphia, Pa.; A. W. Scott, Empire Oil Works, Reno, Pa.

Reception—R. A. Wotowitch, chairman, Henry L. Doherty & Co., New York, N. Y.; Frank B. Fretter, National Refining Co., Cleveland, Ohio; H. A. Logan, United Refining Co., Warren, Pa.; Samuel Messer, James B. Berry Sons' Co., Oil City, Pa.; Wm. Muir, Warren, Pa.; W. E. Wall, Wall & Steigerwald, Cleveland, Ohio; A. C. Woodman, Acewood Petroleum Corp., New York, N. Y.

History—Herbert G. Eaton, chairman, Mutual Refining Co., Warren, Pa.; Geo. P. Brockway, Seneca Oil Works, Warren, Pa.; Louis Carruth, Canfield Oil Co., Cleveland, Ohio; C. D. Chamberlain, National Petroleum Association, Cleveland, Ohio; A. L. Confer, Empire Oil Works, Reno, Pa.; J. A. Fawcett, Crystal Oil Works, Oil City, Pa.; W. H. Fehsenfeld, Red "C" Oil Co., Baltimore, Md.; Frank B. Fretter, National Refining Co., Cleveland, Ohio; Wm. Muir, Warren, Pa.; W. E. Wall, Wall & Steigerwald, Cleveland, Ohio.

Finance—Otto Koch, chairman, Kendall Refining Co., Bradford, Pa.; Louis Carruth, Canfield Oil Co., Cleveland, Ohio; T. J. Hilliard, Waverly Oil Works, Pittsburgh, Pa.; G. B. Hunter, Emlenton Refining Co., Emlenton, Pa.; H. A. Logan, United Refining Co., Warren, Pa.; C. L. Suhr, The Pennzoil Company, Oil City, Pa.; A. C. Woodman, Acewood Petroleum Corp., New York, N. Y.

Banquet and Entertainment—S. P. Worthington, chairman, Tiona Petroleum Co., Philadelphia, Pa.; Fred G. Clark, Fred G. Clark Co., Cleveland, Ohio; L. C. Jamieson, Viking Oil Corp., Clarendon, Pa.; C. H. Longshore, Acewood Petroleum Corp., New York, N. Y.; R. A. Wotowitch, Henry L. Doherty & Co., New York, N. Y.

Attendance and Publicity—Howard H. Greene, chairman, Kendall Refining Co., Bradford, Pa.; A. F. Anderson, Continental Refining Co., Oil City, Pa.; John A. Beck, Pennsylvania Refining Co., Karns City, Pa.; C. A. Boler, Tiona Refining Co., Philadelphia, Pa.; B. W. Browne, Great Western Oil Co., Cleveland, Ohio; Sheldon Clark, Sinclair Refining Co., Chicago, Ill.; John S. Cordell, Cities Service Refining Co., Boston, Mass.; G. C. Davison, Tri-State Refining Co., Kenova, W. Va.; Fred C. Eaton, Valvoline Oil Co., Warren, Pa.; J. P. Flynn, Ohio Valley Refining Co., St. Marys, W. Va.; H. F. Fuller, Sinclair Refining Co., New York, N. Y.; D. W. Grant, Franklin Creek Refining Co., Franklin, Pa.; C. A. Gustafson, Gustafson Bros. Oil Co., Chicago, Ill.; T. C. Hawkey, Tidioute

(Continued on page 110)

Phillips Petroleum Makes Two New Motor Fuels

Bartlesville.—Two motor fuels, each a natural gasoline product, have been announced by the Phillips Petroleum Company of Bartlesville. The two the result of a research effort of several years by Phillips engineers. Following the research and the perfection of the two gasolines, each has had thorough tests in automobile and in airplane engines, the two types of motors, for which the fuels were perfected.

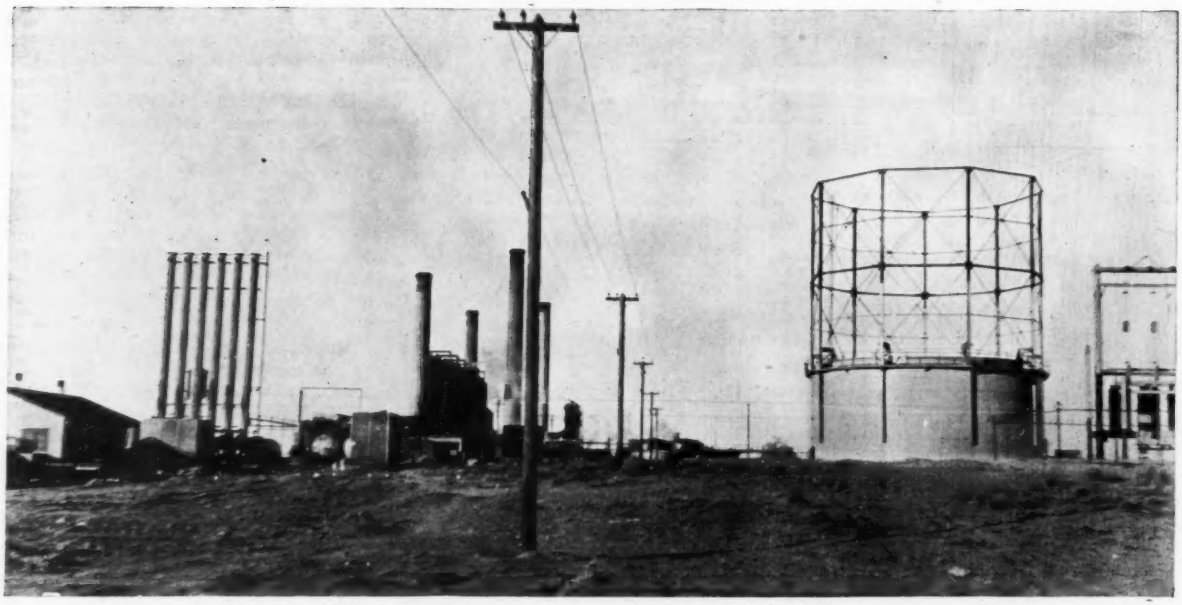
Along with the announcement of the new products, O. L. Cordell, former vice-president of the Waite Phillips Company, was named assistant sales manager of the Phillips Petroleum Company. He is to have charge of retail sales. This indicates the entry of the Phillips Company in the retail part of the petroleum industry.

The announcement concerning the motor fuels follows:

"Phillips Nu-Natural Gasoline for motor cars is a high-quality product superior not only to the average motor fuel but to the premium gasolines now marketed. It has as its particular recommendation the ability to quickly start a cold motor even in zero weather, giving quick acceleration or pickup, and eliminating all knock in the automobile engine. It gives equal or increased mileage per gallon and with the above qualities greatly increases the ease of handling a car under all conditions.

"The company owns its own plane equipped with the new Wright whirlwind motor which is a type of engine requiring the very highest quality gasoline for the best operation. This plane has been used almost continuously in test work. Among the many tests that this aviation gasoline has undergone is a coast-to-coast flight under the variable atmospheric conditions customarily encountered. Many fliers and plane manufacturers have collaborated in the tests of this gasoline which have shown that it eliminates engine knock and is thus peculiarly fitted to be used in the new high compression, whirlwind airplane motors. The tests have also shown that a smaller gallonage is burned per hour of flight, that a greater number of revolutions per minute and therefore greater power and speed are obtained through its use, and that it weighs one-half pound less per gallon. This all means increased speed and smoother operation of the plane with considerably greater mileage for the weight of gasoline carried which makes it exceptionally well suited for long flights.

"Because of the high qualities of this gasoline as demonstrated in these tests, three contestants for the Dole prize in the nonstop flight from San Francisco to Honolulu which will start August 12, will use this gasoline. The company has also underwritten, with other Oklahomans, an airplane flight from Bartlesville, Okla., to Tokio, Japan. The ship, Oklahoma, will use Phillips New Aviation Gasoline exclusively and will start from Bartlesville for a nonstop flight to San Francisco, leaving there on August 12 for Honolulu with other Dole prize competitors. At Honolulu the plane will be re-fueled for its flight to Tokio."



GAS HOLDER (EMPTY) PARCO, WYOMING, PLANT OF THE PRODUCERS & REFINERS CORPORATION

Construction Details for Holder for Uncondensable Still Gases

By H. L. KAUFFMAN

A TWO-LIFT gas holder in a steel tank, having a capacity of 100,000 cubic feet, has been in use for about four years at the Parco, Wyoming, refinery of Producers & Refiners Corporation in storing dry, uncondensable still gases (gases obtained originally from the crude re-run and cracking stills), that had been passed through the refinery absorption plant and natural gasoline recovered therefrom; after which the dry gas was stored in the gas holder and thereafter used as refinery fuel.

This gas holder was built at the Parco refinery by the Stacey Brothers Construction Company, Cincinnati, Ohio, under contract arrangements made with the J. G. White Engineering Corporation, who were the engineers in charge of most of the construction work in building the plant at Parco.

The essential equipment comprising the particular gas holder under discussion included a steel-plate, gas-holder tank, 57 feet 5 inches diameter by 23 feet 10 inches deep; a two-lift gas holder, the inner section of which was 53 feet diameter by 22 feet 10 inches deep, while the outer section was 54 feet 11 inches diameter by 22 feet 10 inches deep; an external guide-frame, consisting of nine steel H-beam standards or columns, and two tiers or rows of steel angle girders with the necessary diagonals or cross-bracing in all bays; together with inlet and outlet connections, including drip-pots, etc.—the whole resting upon a concrete foundation.

The holder was designed and constructed under the pressure specification that when the holder was fully inflated with gas of 0.45 specific gravity, the pressure shown upon a gauge in inches of water column, located at the outlet, should be about as follows:

Inner section alone .....5.1 inch
Both sections fully inflated 8.5 inch

Because a detailed description of the construction of a gas holder is not always readily available to the engineer or refinery man who is interested in such matters, full information will be given in succeeding paragraphs concerning the construction of the gas holder at the Parco refinery.

Steel Tank

The bottom is made of rectangular steel plate one-fourth-inch thick, weighing 10.20 pounds per square foot, and punched for five-eighths-inch diameter rivets, with the outer plates conforming to the radius of the tank and securely riveted to the bottom curb angles.

The tank shell is made up of four courses or rows of steel plates, nine plates to each course. The first or lower course of the shell is made of five-sixteenths-inch steel plates, weighing 12.75 pounds per square foot, while the three remaining courses are of one-fourth-inch steel plates, weighing 10.20 pounds per square foot.

All vertical and horizontal seams are lap-jointed, the vertical joint of the first or bottom course triple, the second course double, and the upper two courses single riveted, all with five-eighths-inch diameter rivets.

The bottom curb is formed of a ring of 3 by 3 by ⅜-inch steel fillet angles, each weighing 7.2 pounds per lineal foot, bent to the proper radius, and securely riveted to the bottom and shell plates.

The top curb is formed of a ring of 3 by 3 by 5/16-inch steel fillet angles, each weighing 6.1 pounds per lineal foot, bent to the proper circle and securely riveted to the top course of shell plates and to a horizontal girder or balcony.

All the ends of the curb bars were neatly trimmed, butted together and connected with suitable angle pieces.

Around the upper edge of the tank, securely riveted to the top curb, and extending outward 18 inches, there is a polygon-shaped, horizontal girder or balcony, consisting of 3/16-inch steel plates, weighing 7.65 pounds per square foot, reinforced on the outer edge and underside with a 5-inch steel channel weighing 6.7 pounds per lineal foot. Securely attached to the upper

course of shell plates of the tank and to the top of the standard supports and connected to this outside reinforcing ring of balcony there are 18 supporting brackets made up of 3 by 2 by ¼-inch steel fillet angles and 3/16-inch steel web plates, weighing 7.65 pounds per square foot.

Securely attached to the edge of the outer walk there are 27 stands consisting of 3 x 2 x ¼-inch steel fillet angles, weighing 4.1 pounds per lineal foot, which serve to hold in place the guard-railing consisting of a double ring of 1-inch diameter steel pipe bent to the proper curvature.

Attached to the inside of the shell of the tank, equi-distant to the circumference, there are 18 guides, each composed of a 4-inch steel I-beam, weighing 8.5 pounds per lineal foot, upon which the bottom carriage rollers of the outer section of the holder work.

In the bottom of the tank, equally spaced in the circumference, there are 18 rest or landing blocks, each consisting of an 8-inch H-beam, weighing 34.3 pounds per lineal foot, for supporting the holder when it is not in service.

A steel pier made up of two 6-inch steel channels, and ¼-inch steel plates, thoroughly riveted together and securely attached to the bottom of the tank, in the center, supports the crown of the holder when it is not in service but instead is resting on the landing blocks.

Securely attached to the upper course of shell plates of the tank, there is provided a cast-iron overflow tapped for a 3-inch pipe which carries off the surplus water in the tank. This overflow is arranged so that the water level in the tank can be lowered when desired to permit painting of the plates along the usual water line.

Inner Section

The crown of the holder is flat and non-trussed, and when not in service it is supported by the previously-described pier erected in the tank.

The sheets and plates of the crown are made up of four circular courses or rows, arranged radially. The center circular crown plate is 80-inches in diameter and ¼-inch thick, weighing 10.20 pounds per square foot and punched for 3/32-inch diameter rivets.

The outside or curb row is about 28-in. wide, measuring radially and made up of ¼-in. steel plates, weighing 10.20 pounds per square foot, securely connected to the top angles, and to each other, with ½ inch rivets and to the adjoining courses of the crown with ⅜ inch rivets.

The three intermediate courses or rows of the crown are composed of 3/16 inch B. W. G. sheets, weighing 7.65 pounds per square foot, securely riveted together throughout with ⅜ inch rivets.

The top curb consists of a ring of 4 x 3 x 7/16 inch steel fillet angles, weighing 9.8 pounds per lineal foot, bent to the proper radius and securely riveted to the out-side of crown plates and to the top course of shell plates. The ends of the bars were neatly trimmed, butted together and connected with suitable joint pieces of ample strength.

There are seven courses or rows of side sheets in the inner section.

The top and bottom courses are 24 inches wide, and formed of ¼ inch steel plates, weighing 10.20 pounds per square foot, firmly secured to the top curb angles and bottom cup channels, and to each other, with ½ inch and to the adjoining intermediate courses of sides with 5/16 inch rivets.

The five intermediate courses are composed of No. 10 B. W. G. sheets, weighing 5.45 pounds per square foot, securely riveted to each other throughout with 5/16 inch rivets.

The hydraulic cup on the lower edge of this section is bent to a circle of 53 feet diameter on the inner flange and formed of a seven inch steel channel, weighing 12.25 pounds per square foot, to which is riveted on the outer flange, with ½ inch diameter rivets, steel plates 15 inches wide, ¼ inch thick, weighing 10.20 pounds per square foot, reinforced on the upper edge and on the outside with a band of 2 x ½ inch half oval. The ends of the channel bars were neatly trimmed, butted together and connected with suitable joint pieces of ample strength.

Equally spaced in the circumference of the innner section and securely attached to the inside of the shell sheets, there are 18 vertical legs or upright stiffeners, each consisting of a 5 x 3 x 5/16 inch steel fillet angle, weighing 8.2 pounds per lineal foot.

The upper end of each of the nine verticals is provided with a wide gusset plate having angles riveted to the upper edge which, in turn, are securely riveted to the underside of the outside row of crown plates, aiding in the support of the carriages, which are located directly above the verticals.

There are attached to the crown of the holders, opposite the standards or columns of the guide-frame, nine carriages or goose-necks of plate and angle construction, fitted with cast-iron radial and tangential adjustable rollers with turned axles or pins.

Securely bolted to the underside of the cup channels there are eighteen steel brackets with cast-iron barrel rollers to work upon the channel verticals on the inside of the outer section of the holder.

Around the outer edge of the crown, spaced equi-distant in the circumference, there are placed 3 x 2 x ¼ inch steel fillet angles standards or posts, which serve to hold in place the guard railing consisting of a ring of one inch pipe bent to the proper curvature.

In the crown of the inner section of the holder, there is placed a manhole of suitable size, provided with a removable cover.

Also, in the crown of the inner section of the holder, directly above the inlet and outlet pipes, there are placed bonnets of suitable size with removable covers.

Outer Section

The grip on the upper edge of the outer-section is bent to a circle of 54 feet 11 inches in diameter on the outer flange and formed of seven inch steel channels, each weighing 12.25 pounds per lineal foot to which is riveted on the inner flange with ½ inch rivets, ¼ inch steel plates, 24 inches wide, weighing 10.20 pounds per square foot, reinforced on the lower edge and on the inside with a band of 2 x ½ inch half oval.

Nine inches of these grip plates extend above the channel bars of grip, thus forming a dam, which prevents an outwardly over-flow of water from the cup of the inner section. The ends of the channel bars were neatly trimmed, butted together and connected with suitable channel joint pieces of ample strength.

The top and bottom rows of the shell are each about 24 inches wide and consist of ¼ inch steel plates, weighing 10.20 pounds per square foot, securely riveted to the grip channels, the bottom curb angles and to each other with ½ inch and to the intermediate courses of the shell with 5/16 inch diameter rivets.

The five intermediate rows are composed of No. 10 B. W. G. sheets, weighing 5.45 pounds per square foot, thoroughly joined to each other throughout with 5/16 inch rivets.

The bottom curb is formed of a ring of 5 x 3 x ⅜ inch steel fillet angles, each weighing 9.8 pounds per lineal foot, bent to a proper circle and securely riveted to the lower course of the shell plates.

The ends of the bars were neatly trimmed, butted together and connected together with suitable angle joint pieces of ample strength.

There are 18 verticals, equally spaced in the circumference of the outer section, each vertical consisting of one four inch steel channel, weighing 5.4 pounds per lineal foot, to which is attached on each flange 1½ x 1½ x ¼ inch steel fillet angles, each weighing 2.34 pounds per lineal foot.

These angles originally were in short lengths, cut to fit between the horizontal seams, and then were securely riveted to the side sheeting.

Securely attached to the grip channels, there are placed nine steel carriages of similar design to those described for the inner section.

Securely attached to the bottom curb angles, there are 18 steel brackets with cast-iron rollers to work against the tank guides secured to the inside of the tank.

Each of the nine steel standards or columns consists of an eight inch H-Beam weighing 34.3 pounds per lineal foot, about 47 feet five inches high, and each extending 18 feet below the top of the tank and secured thereto by means of suitable 5/16 inch steel plate brackets.

There are two tiers or rows of steel angle girders—one at the top of the standards or columns and one intermediate. The first or lower tier or row of girders is composed of 6 x 6 x ⅜ inch steel fillet angles, weighing 14.9 pounds per lineal foot.

The second or upper tier of girders is composed of 5 x 5 x ⅜ inch steel fillet angles, weighing 12.3 pounds per lineal foot. These girders are thoroughly riveted to the standards or columns.

In the bays formed by the standards and girders, there are provided diagonal

(Continued on page 106)

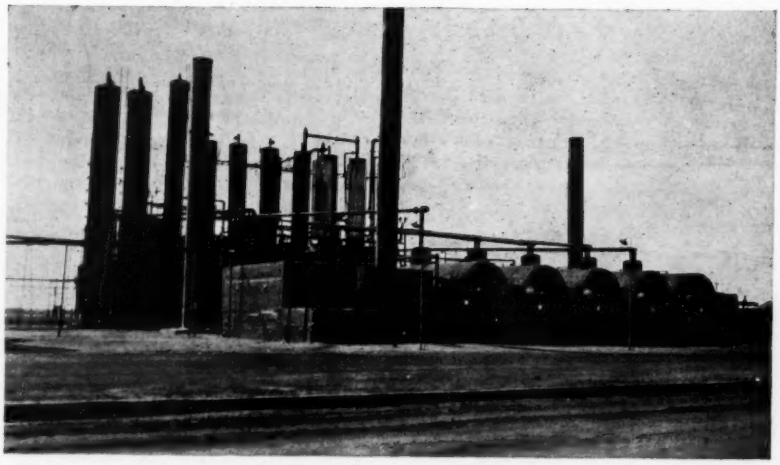
Noble Plant Had First Bell-Cap Towers in North Texas

By GEORGE REID

THE bell-cap or baffle type tower first made its appearance in the North Texas refining district, at the 3000-barrel refinery of the Noble Oil & Gas Company at Burkburnett, Texas. Bubble towers were designed and constructed by the company's engineering department, were put in operation in the spring of 1924.

After some few months of operation, during which time the practicability of the new dephlegmator was definitely proven, the original tower installation was dismantled, and dephlegmators of larger, and slightly different design, were installed. These fractionating columns were placed in service in the early part of 1925 and have remained in almost constant use since. So far as the North Texas area is concerned, where now the bubble type installation is common to practically all of the operating refineries, it may be stated, that the Noble Company pioneered the way of the bubble type column and definitely proved its economy, efficiency, ease of handling and other advantages, to the satisfaction of all the neighboring plants, with the result that the device is now of extensive application in the area.

Distillation and fractionation equipment at the Noble plant is illustrated in the accompanying photographs. This installation might be termed a new plant, since it supplanted the company's older refinery equipment in 1924. The first, or old plant, was in operation from 1918 to 1924. The refinery as at present operated consists of pipe still and five shell stills with the bubble type of fractionating equipment.

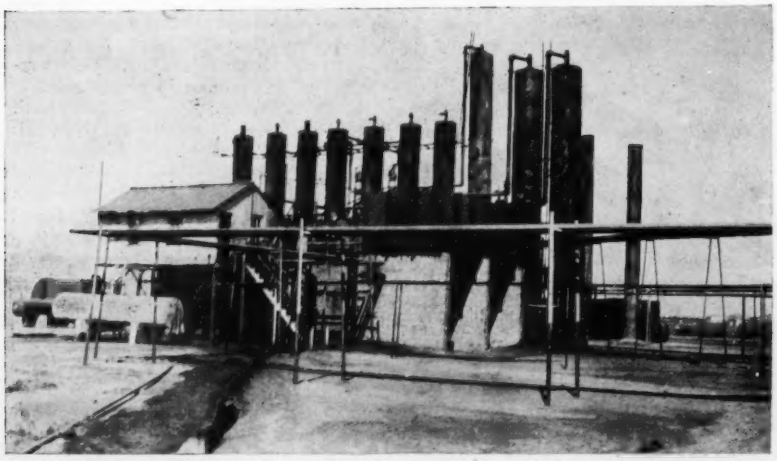


VIEW OF BUBBLE TYPE FRACTIONATION EQUIPMENT, CONDENSERS AND RECEIVING HOUSE AT NOBLE'S NORTH TEXAS PLANT

Plant Method

Crude charged to the plant is the usual 38-40 gravity oil as produced in the North Texas area. The fresh oil is charged by steam pump, through the heat-interchanger, from where it is conducted to the pipe still. This still consists of 36 joints of 4-inch tubes over the fires, and 60 joints of 4-inch in the next coil, called the second tube bank, which is heated by the flue gases en route to the stack. Crude oil in its travel through this tubular retort is heated to sufficient temperature to assure the vaporization of light gasoline only. The heated oil is discharged or released into an 8x20 foot vaporizer, or separator. At this point the gasoline vapors are conducted away from the oil and into the bubble tower. This tower is 5x40 feet in dimensions and consists of two sections. In the lower half of the tower there are seven bubbler plates with as many 6-inch in diameter bubble caps as the area of each plate will accommodate. In the upper section there are seven perforated baffle plates, with ½-inch perforations. This first heating of crude oil in passing through the pipe still effects the vaporization, fractionation and condensation of better than 26 per cent of the crude charged, which is accumulated as light gasoline.

The crude leaving the vaporizer is conducted to the 5x30 foot shell stills in continuous series. Each of these shell stills is equipped with a bubble tower of similar construction as the one previously described. The first of the shell stills is derivitive of the second gasoline stream and the fractionating column working in conjunction with this still yields a stream of light gasoline which is blended with this first stream to produce that type of gasoline commonly termed "export." This second still and tower yields approximately 8 per cent of the crude as the second cut. The first cut of 26 per cent plus the second cut of 8 per cent re-



FRONT VIEW OF NOBLE OIL & GAS COMPANY'S 3000-BARREL REFINERY AT BURKBURNETT, TEXAS

sults in a total amount of light, or "under 400 end point" gasoline yield, of about 34 per cent. This is an excellent yield of light gasoline to be derived from the type of crude oil charged. With judicious manipulation of temperatures, etc., this yield is at times increased above the figure mentioned. Yields of various grades of gasolines, however, are governed almost entirely by the class of material desired or required to fill orders. In other words, refinery operation is often governed by market conditions.

The third stream derived from the battery of shell stills represents about 8 per cent of the crude charged to stills and is termed "naphtha." The specifications here are 47-48 gravity, 450 end point material, usable as a blending stock in the preparation of many types or blends. All three streams of distillate combined or blended together form U. S. motor gasoline, and represent a total yield from the crude oil of around 42 per cent.

Kerosene is prepared from the fourth still, averaging about a 5 per cent yield of the 41-43 grade. Prime white distillate is derived from the last still of 38-40 grade, having better than a 400 degree F. initial, and with 190 degree F. open cup flash. The last stream is not fractionated, and represents about 6½ per cent of the crude. The remaining residium after the shell still operation is conducted through the exchanger, cooled and transferred to storage.

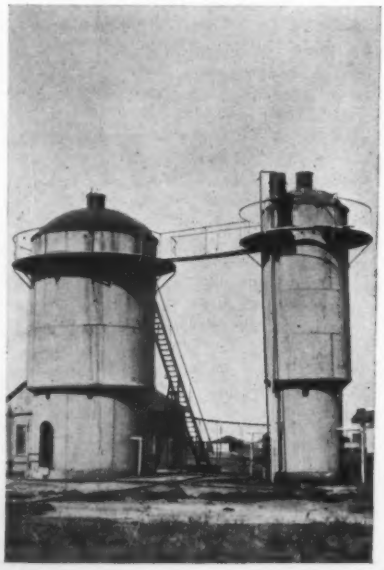
Cooling Water

The water cooling equipment as installed at this plant is a feature of interest. There are two large cooling pits working in series. An Ajax 10-horsepower steam engine is shaft connected to two 6-inch Fairbanks-Morse centrifugal pumps, belt driven, comprises the power unit for the circulation of water. One of these centrifugal pumps picks up water from the second pit and forces it over the condenser boxes. From the boxes the water flows by gravity through approximately 500 feet of wooden metal-lined flume. This flume conducts the water to the first large storage reservoir. Water spilling from the end of the flume falls over louvres in a 20-foot drop. The temperature of the water during this travel and spilling over the louvres is reduced 14 to 20 degrees Fahrenheit. The second centrifugal pump picks the water up in the first pit and conducts it to the top of the louvre section of the second reservoir. In this procedure the separation of thousands of finely split streams falling over the louvres results in a further decrease in water temperature of some 10 to 14 degrees. This completes the water cycle, for the first mentioned centrifugal pump has suction on this pit, discharging the cooled water again to the condenser boxes. Both pumps are operated by the same shaft and pulleys which are propelled by the Ajax steam engine.

There are two separate loading racks for the plant. One 22-car rack loads light products, such as gasoline, kerosene and natural gasoline from the company's adjacent natural gasoline plant—while the second 20-car rack is used to load fuel oil and heavier distillates. An interesting item in connection with loading practices at this plant is found in the installation of Grosby pop valves on each loading or pumping manifold. These pop valves, which are set at 25 pounds pressure, enables the loading rack employee to shut down, or close his loading valves against the pump pressure without damage to the pump. The pop valves are installed on the discharge side of the loading manifold. When, for any reason, the "loader" must shut off against the pump, then 25 pounds pressure opens the pop valve and the oil is conducted through a 2-inch line to the suction side of the manifold, and the pump merely circulates oil through the manifold until the pressure is released by continued loading, etc. The installation of these pop or relief valves on the loading pump manifolds has resulted in the saving of one man on the operating force. Pumps are no longer damaged by back pressure on the lines when it becomes necessary to shut off against them. This feature represents a very small outlay of money for its installation, and the fact that damage to pumps is totally eliminated lends importance to its consideration. The practice is to be recommended in all instances where loading racks are located some distance from the pump house.

Treating Equipment

The treating assembly at the Noble plant is shown in an illustration. The larger agitator is 750 barrels capacity, the smaller 300 barrels. The company uses Mathieson Alkali Works calcium hipochlorite in powdered form as packed in metal drums, to treat its gasoline. In this connection the treater has worked out a convenient system for the mixture of water and "chlorine lime" required for treating. As is shown in the photograph, a common steel drum is mounted on the hand rail at the top of the agitator, with a small water line leading up to the barrel. When the small agitator full of oil is to be treated, this barrel is filled with water, the amount being just sufficient to form the proper mixture with the amount of "lime" required to treat this agitator full, efficiently. An Ingersoll Rand 9x8-inch steam driven compressor is used to "blow" the agitators.



AGITATOR ASSEMBLY FOR CHEMICAL TREATMENT OF GASOLINE AND KEROSENE

A 15,000 gallon compression type gasoline plant located adjacent to the company's refinery and on the same property, is the source of natural gasoline for blending purposes. The gasoline plant is equipped with a Carbon-Carbide stabilizer and the entire production of the plant is stabilized gasoline. More natural gasoline is produced than is required for the refinery blending, and the surplus from this plant is marketed in tank car lots.

Anderson Pritchard Sales Official Named

Oklahoma City.—C. L. Mayhall has joined the Anderson Pritchard Oil Corporation of Oklahoma City, to handle refined oil sales. Mr. Mayhall was formerly with the Imperial Oil Marketing Company of Tulsa, leaving early this year.

C. H. Dresser has been placed in charge of industrial naphtha sales, having been general sales manager, of the Anderson Pritchard concern. W. M. Sturgis has become a director of the corporation.

The Anderson Pritchard Corporation has three refineries, one at Cyril, Oklahoma; one at Wichita Falls and one at Colorado City, Texas. The Cyril and Wichita Falls plants are turning out special naphthas for industrial use, while the Colorado plant is making special anti-knock gasoline. The company also is engaged in production.

L. H. Pritchard is president; J. S. Anderson, vice-president; and P. H. Anderson, secretary.

Dallas, Texas.—The Lone Star Gas Company has recently completed and placed in operation a new natural gasoline plant at Hollis, Oklahoma. The installation is a combination compression and absorption type, with a capacity production of 4000 gallons daily. Gas for the new plant is supplied from the Lone Star's new 18-inch pipe line extending from Wheeler County in the Texas Panhandle to the company's main line at Petrolia, Texas. R. F. Foster is the engineer in charge at Hollis.

Greases and Their Manufacture

By GEO. W. CUPIT, JR.
Chemical and Refining Engineer

THE minutest wrist watch requires the lightest oil for its lubrication; while the heaviest, slow moving gears, operating under a high friction, require a lasting and adhesive grease. These are, however, extremes in the subject of lubrication, yet they serve to illustrate that both oil and grease have their respective lubricating fields. The latter will be discussed in this article.

The manufacture of good greases is very difficult and depends upon the skill and science, together with experience, of the grease maker. In truth, a successful grease maker is essentially an artist.

The knowledge of inorganic chemical reactions alone is by no means sufficient in grease making. Neither would I say that grease making is dependent alone upon the knowledge of organic chemical reactions; good grease making involves both.

In many cases both chemical reactions are used independently; but in the majority of cases, they are used together. On this account, many variables are introduced. The greater the number of variables the more difficult it is to make the desired grease.

For comparison, just as two cooks can take the same ingredients and use the same oven, with the result that one may produce a poor product, and the other produce a perfect product; so, in grease making, two batches of exactly the same composition may produce products entirely different in lubricating properties, uniformity, texture, color, consistency, and brightness. This will depend largely upon the knowledge of organic and inorganic chemical reactions, experience, quality of basic products involved, apparatus used, and skill exhibited by the grease maker in adding, in the correct order and at the right time, the various components of the grease.

Two grease makers may start, side by side, using identically the same kinds of apparatus and adding the same components in the proper order, at the one time and at the same temperature, the result being, on the one hand, a semi-fluid grease, and on the other, a hard product. It may be assumed, however, that some variable has entered in which caused the change. No reliable tests have been developed to assist the grease maker in judging his batch or to estimate what the nature of the grease will be several days later after the product has become cold.

If the grease maker is not a trained chemist himself, he should consult one, since the chemist's advice in determining the quality of basic materials, and the methods of processing, govern, to a large extent, the quality of the finished product.

A well equipped laboratory, for both chemical and physical tests, should be at the disposal of both the chemist and the grease maker.

The same general type of apparatus for grease making is employed by nearly all grease plants, and consists of a steam jacketed kettle with a draw-off valve at the bottom and a rotating paddle just clearing the bottom of the kettle; above the kettle there should be independent charging lines for adding mineral oil, fat or fatty acids, water, and base (soda, lime, lead, etc.). These components will be discussed later.

Greases in general contain the following:

1. Fats.
2. Fatty Acids.
3. Base (salts of sodium, calcium or lead).
4. Mineral Oil.
5. Water.

Each of these components has a definite function, and must be added at the proper time in making up the grease. The functions of the components will now be discussed.

Fats

These may be ither of animal or vegetable origin, depending on the nature of the grease desired. In both cases, however, the fats, together with the bases, sodium hydroxide (NaOH) or slaked lime, tend to form a soap which will readily emulsify with mineral oil, and on the addition of the right amount of water will remain as a permanent emulsion. Fats possessing high iodine values (100 or above) make unstable products which soften and darken on the surface when exposed to sunlight. Solid fats produce higher melting point greases than the liquid fats. In cases where liquid vegetable fats were used, those possessing hydroxyl groups produce greases, the soaps of which would scarcely emulsify with the mineral oil.

Fatty Acids

Free fatty acids play an important role in grease making, since they form stable soaps which emulsify readily with mineral oil. A slight excess of free fatty acid in a soap will lower the consistency and melting point of the grease.

In cases where animal fats and fatty acids are used during the saponification, glycerine is thrown out of the fats, and like water, tends to throw the soap formed out of a gel, hence its presence is detrimental. If present in minute quantity, however, glycerine will dissolve in the soap, especially a lime soap, forming a gummy mass, which proves that the solubility between soap and glycerine is limited, with the formation of a substance varying in properties as to solubility, consistency and melting point. Hence, glycerine renders a soap much less soluble in oil and causes the grease to break up at comparatively low temperatures. However, in the presence of a small amount of glycerine, an emulsion will form with much less water.

By the term Fatty Acids is meant those fats from which the combined glycerin has been removed. The fats containing the fatty acids are used to produce soaps which give the body to the grease. However, the fatty acids themselves combine with the base to make these soaps.

Since fatty acids have now become a commercial product, produced by a relatively cheap method of distillation; and the grease maker once having found a fatty acid suitable for the desired grease, can buy on specification, an absolutely uniform raw material, thereby helping him to overcime variations frequently encountered in the manufacture of grease. On account of being of an acid character, the fatty acids unite with the base immediately, so that no prolonged treating and cooking are required to insure complete saponification.

Base

The function of the Base is to form a soap which, when mixed with the mineral oil and water, will give a uniform, permanent emulsion often referred to as gel. The subject of the base is one of vital importance in grease making, and too much care cannot be taken in preparing the lime or caustic soda, in order that the respective soaps may be as pure as possible. In the case of the former (lime), the calcium oxide (CaO) content should be as high as possible with a magnesium oxide (MgO) content as low as possible. There should never be more than a trace of iron, aluminum, carbonates and silicates, and should be void o dirt. In the majority of cases unslaked lime is prefered, due to the fact that it is cheaper than any other form of lime, contains only a small percentage of carbonates, and insures better and more complete saponification.

A satisfactory method for the preparation of slaked lime is as follows: a sufficient weight of selected lump lime for the preparation of one batch of grease should be weighed into an iron kettle; warm water should be added at intervals and in sufficient quantity to prevent the mass from becoming dry; the lime should not be stirred during slaking and water should be two to three inches above the lime when complete slaking has taken place. At this point, and by the use of a spatula, the milk of lime may be mixed

with the water, but not stirred; then allowed to settle a day or two. In this state unslaked lumps of lime and impurities will have settled to the bottom. After settling, the milk of lime should be dipped off the top and screened, care being taken not to disturb the bottom. The residue may be discarded. In order to avoid chlorides in the water used for slaking, drip water from any steam line may be used. Chlorides have a tendency to cause the lime soap and mineral oil to separate, and are therefore highly undesirable.

Mineral Oil

This important component of the grease acts as a solvent or as a vehicle which holds the other constituents together in the form of an emulsion and partly in solution. The nature of the mineral oil used plays an important part in the degree of solubility of a soap, and a fully refined paraffine baseoil of low viscosity (100 at 100 degrees F Saybolt) has been found to possess the greatest solvent action on all lime soaps. The greater the viscosity of the mineral oil used, the lesser the tendency to hold the soap in solution.

It must be remembered, too, that not only does a mineral oil aid in forming an emulsion, but likewise aids in the formation of a gel. The generally accepted idea of a grease is an emulsion of a lime soap in a mineral oil. This is not altogether correct. In the absence of glycerine, a lime soap is readily soluble in mineral oil, and on cooling forms a stable gel which closely resembles a grease and possesses good lubricating properties. However, there is one other component necessary in grease making, and that is water.

Water

Water is necessary, firstly, in the preparation of the milk of lime, otherwise there would be little or no recation between lime and fatty acids; secondly, a slight excess of water should be present at all times to prevent the mass from drying and hardening in the kettle during agitation and heating; thirdly, the right amount of water present (determined by the formula of the grease to be made), insures smoothness of the finished product. Only a small percentage of the water added during the process remains in the final grease. This figure the grease maker must determine when finishing the grease.

The addition of water to a fat grease (one from which the glycerine has not been removed), diminishes the glycerine content and therefore increases the solubility of soap in mineral oil, with the result that a state of suspension becomes one of emulsion.

The action of water on a fatty acid grease is just the opposite to its action on a fat grease. Hence, we may conclude that up to a certain point an increase in water increases consistency, because there is more soap in emulsion. For the same reason and because the lime soap has a greater melting point than the glycerine soap, the melting point is increased. The real function, then, of the water is to decrease the solubility of the soap in oil, and to throw it into an emulsion. Large amounts of water decrease consistency. It is obvious that if conditions are such that the soap is entirely insoluble in the mineral oil (hence no gel), or is completely soluble in the mineral oil (hence no emulsion), the product will not be a true grease.

A point that must be remembered regarding the application of water is this, the addition of much water before saponification takes place causes curds. If such a case arises, it is wise to begin over again.

The above knowledge of the components of a grease is of little practical value unless one is able to put them together properly to make a good grease. Therefore, it is necessary to know the various types of greases in order to follow the proper method of preparation. They are in general:

(1) Cup Greases.
(2) Sponge Greases.
(3) Fibre Greases.
(4) Graphite Greases.

Each type of grease has its specific method of preparation, and affords an interesting and varied problem. Let us discuss their manufacture.

Cup Grease

The formula to be used is the following:

100 pounds Lime.
4 ounces Organic Dye (color: orange or yellow).
40.5 gallons Hog Fat.
40.5 gallons Hoss Fat.
19.0 gallons Cottonseed Oil (summer yellow).
9.0 gallons Water (drips from steam line).
600.0 gallons Light Paraffine Oil (100 Vis. at 100 degrees F. Saybolt).

The organic dye is added to give the desired color of grease, and the cottonseedoil is added to give consistency, or in other words, hardness to the grease. The cottonseed oil should meet the following specifications: Tests:

F. F. A.:—.3-.4%.
Iodine Number:—100.0-112.
Sapon.:—193 (min.).
Color NPA:—2½ (max.).
Grav.:—21.8-22.0.
Flash:—600.0-605.
Vis/100:—168.0-180.
Cloud:—26.0-28.
Pour:—25.0-30.

The mineral oil should first be strained and the organic dye added. The lime should be prepared by the method given above under Base. Add the milk of lime to a small amount of the paraffine mineral oil, which would be one quarter of the volume of fats used and mix well. For convenience, call this Mix "A". Mix "B"—mix thoroughly the hog fat, hoss fat and cottonseed oil; pour Mix "A" into Mix "B" and stir by means of a revolving paddle; when well mixed, turn on jacket steam gradually and heat uniformly to avoid too much foaming. When the boiling point of the mass has been reached, maintain this temperature until complete saponification has taken place, then raise the temperature until nearly all the water has been boiled off. At this point the soap will be a viscous liquid. Add now approximately two-thirds of the remaining mineral oil (light paraffine oil), and heat to 265 degrees F and add the water slowly. The result will be an emulsion. The remainder of of the paraffine oil should be added slowly in small portions at a time, otherwise the emulsion will cool and will therefore harden, necessitating reheating, which should be avoided. Too high a temperature should be avoided on account of the tendency of the soap and oil to separate. An excess of water should be present to prevent a separation. In finishing a grease (all mineral oil being worked in), the longer the stirring continues below the melting point of the grease, the higher will be the polish, and the more the consistency will be destroyed.

Adhesion is a very desired property; hence,—suspensoids should be the products strived for, and this may be accomplished by drawing the grease from the vat at approximately 15 degrees below its melting point. If the above method has been strictly adhered to, a grease possessing a pale yellow color, good consistency, smoothness and excellent lubricating qualities will be obtained. Two of the most essential points in making this grease are to prevent loss by failure to obtain full saponification value of the fatty acids, and also to keep down the amount of free lime.

Sponge Greases

The formula to be used is the following:

1500 pounds "A" Tallow.
5 ounces Organic Dye (yellow).
95 gallons Caustic Soda (30 degrees Be').
898 gallons Light Paraffine Oil (100 Vis. at 100 degrees F. Saybolt).

The "A" tallow should meet the following specifications:

Sapon. Number:—193.
Free Fatty Acid:—1½ (max.).
Odor:—Mild.
Moisture:—None.
Color N. P. A. (when liquid):—2. (max.).
Titer Test:—42.
Pour:—55.-75.
Flash:—595 degrees F. (min.).
Vis. at 100 degrees F. (Saybolt):—185-195.
Gravity-Be:—23-5 degrees.

The caustic soda should be void of impurities and turbidity. Procedure:—To one half of the melted "A" tallow add the caustic soda (30 degrees Be), followed by the mineral oil in small quantities, 50 gallons at a time. When approximately one-half of the mineral oil has been added, add remainder of "A" tallow at 210 degrees F and cook until complete saponification has taken place and most of the water has been boiled off. At this point of the procedure the batch has balled up into an elastic mass of long interwoven fibres. Slowly work in the

(Continued on page 64)

Activated Charcoal for Recovering Gasoline

By ISMAR GINSBERG

THE use of activated carbon or charcoal for the purpose of absorbing gasoline vapors from gas has assumed practical features, since the basic and classic article on the subject of adsorbing substances in charcoal and other coarsely-grained adsorbents and the methods used for driving out these adsorbed substances, that is Berl and Schwebel's article published in Zeitschrift fuer angewandte Chemie, 1923, volume 70, pages 541 ff. It was mentioned in this article that the best process for removing the adsorbed substances was by a combination of external heating, internal vacuum and heating with steam. The results that have been obtained in practice by the use of this process have agreed very well with the claims that were originally made for it by the inventors. Nevertheless a certain difference has been found in the quantity of steam that is required for this process and this has been due, as often is the case, to the difference that exists between laboratory testing of a process and its actual operation on a practical scale. The question of "flushing" is important and Dr. G. Mueller goes into considerable detail in describing this important effect in the use of activated charcoal in his article in Petroleum Zeitschrift, 1926, No. 28, pages 1043 ff. The following article contains the gist of the information that is published in the aforementioned report.

The action of steam on the charcoal, containing the adsorbed materials, is static in accordance with general opinion on this subject. This is based on the assumption that a condition of equilibrium exists when a definite amount of steam with a very low speed is allowed to enter the adsorption vessel, which contains a shallow bed of adsorptive carbon. The loading of the carbon with the adsorbed material is hereby reduced to such a point it stands in agreement for example with the benzol vapor partial pressure in the vapor mixture which surrounds the adsorption charcoal. This is in accordance with the law of isothermal adsorption. This then means that the quantity of substance adsorbed by the charcoal and also the partial pressure of the benzol or other vapor does not vary much throughout the small depth of the filtering medium.

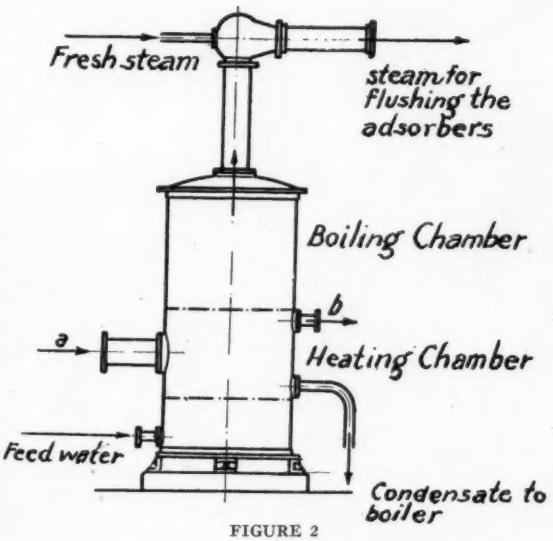


FIGURE 2

However, in practical operation the conditions are quite different. For the steam effects a rapid "washing" or "flushing" of the carbon filter. This means of course that the steam acts not statically but in a dynamic manner and the fresh steam that is added to the adsorbent vessel drives out the steam that is already present in it. The result is that the regeneration of the carbon is effected in an atmosphere which contains almost zero per cent of the substance that is being removed from the charcoal, benzol in this case or gasoline in another, and the partial vapor pressure of these substances in the atmosphere is almost nil.

Steam Action

On the other hand, as the steam passes through the layer of charcoal, it becomes more and more concentrated with benzol vapors in this case and this highly concentrated mixture produces the effect that the charcoal, which is located at the point where the vapors leave the apparatus, is constantly loaded with adsorbed substance up to the very end of the process. This infers that a mixture of steam and benzol or other adsorbed substance will be maintained in a high concentration of the latter right through the process.

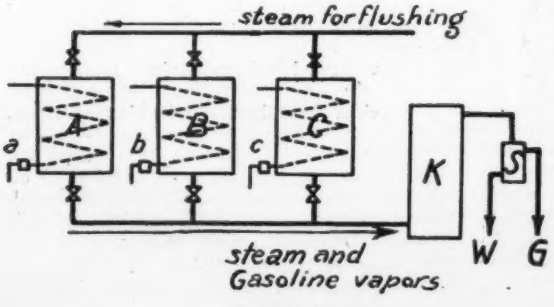


FIGURE 1

Thus this condition can be summed up in the following words. When the steam is admitted very gradually to perform its task of driving out the adsorbed vapors from the activated charcoal and when the latter is present in only shallow depth in the adsorbent vessel, then a mixture of vapors is removed from the latter in which the concentration of the benzol or other substance rapidly decreases, but when the steam is admitted rapidly to the vessel and the "flushing" effect is produced, then the concentration of the adsorbed substance in the vapor mixture leaving the apparatus is decreased for the first time towards the end of the process. Therefore, in the latter case the quantity of "flushing steam" used per cubic meter of product drives off a much greater amount of the adsorbed substance from the charcoal filter than in the former case.

The real practical value of this "flushing" action is shown by the example that is cited below in which are described the operations in a modern gasoline recovery plant working under normal conditions. The following results were obtained with an external heating temperature of 135 degrees C which was obtained by means of a

specially constructed steam heating system.

Initial content of adsorbed material in carbon. Grams per 100 grams carbon	Final content of adsorbed material in carbon Grams per 100 grams of carbon	Steam consumed per 100 grams of C. for the period of driving off the adsorbed substance	For driving off 20 gms. up to the endpoint
20	18	2.2	2.2
18	16	5.4	7.6
16	14	6.9	14.5
14	12	10.5	25.0
12	10	18.3	43.3
10	8	32.5	75.8
8	6	70.0	146.0
6	4	243.0	389.0
4	2	980.0	1369.0

In practcal operation the thickness of the adsorbing medium is greater than what has ben indicated above in an experimental installation and in order to be sure that there are no losses of substance due to supersaturation of the adsorbent it is customary to stop the operation when the carbon contains about 16 per cent of the adsorbed substance and then the latter is driven off until the content falls to about two per cent. It has been found that 1360 kilograms of direct steam were used under these conditions per hundred kilograms of the carbon. It is more practical to report these figures in terms of material driven out of the carbon. It has thus been found that from 1.9 to 2.5 kilograms of steam are required for driving off one kilogram of gasoline adsorbed by the charcoal. It has also been found that the amount of steam used in the case of benzol is 97 kilograms per kilogram of the solvent. This very great difference between the two cases is due to the fact that gasoline contains ingredients whose boiling point lies considerably below that of benzol.

Vacuum Not Needed

These low figures for steam consumption have also made it unnecessary to apply a vacuum in driving off the adsorbed gasoline. The savings which were hoped by the use of a vacuum were more than counterbalanced by the difficulties that were encountered in the operations, the leaks which unavoidably occurred in the various tanks, pipelines, valves and other parts of the vacuum installation.

An Innovation

There has, however, been introduced a certain innovation in some of the new gasoline recovery installations and this refers to the reduction of the steam used in driving out the adsorbed gasoline. This innovation which is in the nature of automatic regulation of the flow of steam is effected without the use of any complicated apparatus. The new improvement is connected with the compression-evaporation system and has been used with good results in practice.

The ordinary arrangement is seen in Fig. 1. Just B of the three adsorbers shown in the figure (A, B and C) may be used in the regeneration process. The flushing steam enters at the top and the mixture of steam and gasoline vapors leaves at the bottom. In order to avoid strong condensation on the cold charcoal at the beginning of flushing, each filter is provided with a special coil heating system, by means of which indirect heating of the charcoal is accomplished before the steam is admitted to drive off the gasoline vapors. The entire latent heat of the steam within the heating coils is transmitted to the charcoal and the condensed water is removed through the outlets, a, b and c.

The mixture of flushing steam and gasoline vapor is then carried to the condenser and cooling arrangement at K. The condensed mixture is then separated in the separator S into water W and gasoline G. In this method of working the apparatus, almost the total heat content of the steam mixture is led into the condenser. This loss of energy is regrettable all the more for the reason that large amounts of cooling water are required for the cooling effect and at times it is only with considerable cost and great difficulty that it is possible to obtain sufficient water for this purpose.

The new process, which employs the compression boiler, utilizes the heat in the vapor mixture for the production of new steam. The principle of the process is shown in Fig. 2.

The vapor mixture which comes from the absorbers is led through "a" into the heat interchanger, where the latent heat is set free due to condensation of the vapors and is then transmitted through the walls of the heating tubes into the water in the boiling space. The uncondensed portion of the vapor is then led through the pipe b of the condenser group, whose extent and whose need for cooling water are considerably reduced.

The transmission of the heat from the heating chamber in the boiling space is rendered possible, in that the pressure in the latter has been reduced to approximately 0.6 atmosphere. At this pressure the boiling temperature of the water which is to be evaporated lies between 80 and 85 degrees C, so that a sufficient temperature drop occurs from the heating chamber to the boiling chamber to carry over the heat. The vacuum in the boiling chamber is attained by means of the steam injector at the top of the apparatus, which is fed with fresh steam (saturated steam) from the boilers. When the boiler pressure is seven to ten atmospheres, it is possible to mix the steam with recovered steam in the proportion of one to one.

Steam Flushing

This has sometimes to be done when the boilers are being driven, for their operation varies considerably in accordance with the requirements of the plant. On the other hand the practice is also followed out when the boiler plant is large for the reason that considerable economy is effected in this manner.

The apparatus has been successfully used in a Galician gasoline installation of seven thousand kilograms daily capacity, while another similar installation yields a daily production of 20,000 kilograms of gasoline. Actual experience with the operation of the apparatus has shown that it works simply and there are no serious operating difficulties of any sort. The fresh steam valve is opened up at the beginning of the flushing operation, and the apparatus then works in the following manner.

At the start of the flushing of an adsorber with steam to drive out the adsorbed gasoline, the charcoal in which is heated by means of a steam coil, small quantities of steam are sufficient to drive out the gasoline constituents which are most loosely combined with the charcoal and also the permanent gases. In the installations that have been operated up to the present time, experience has shown that a very high peak load condition is attained in the condensers and coolers under these circumstances, and this state of affairs has always been found difficult to overcome. This is principally so for the reason that due to the unavoidable admixture of permanent gases the heat transmission coefficient is reduced to a mere fraction of its normal value. Hence the condensers and coolers do not operate at full efficiency at any rate. The results of this condition are that considerable quantities of gasoline are lost because they are not condensed. This refers particularly to the fractions that are first evolved from the activated charcoal, which are of course lower boiling products than what comes off during later stages of the process. On the other hand these products can be saved if they are allowed to evolve from the activated charcoal together with the more slowly evolving and heavier ingredients of the gasoline. The operator must learn to open the steam valve very gradually, which admits the steam to drive out the gasoline hydrocarbons adsorbed in the charcoal. But it is a very difficult thing to teach the operator how to do this and it is foolhardy to expect him to do this regularly especially when it becomes necessary to manipulate the valve frequently during the operations.

With the compression evaporator the fresh steam valve can be opened wide right at the start of every process. Evaporation first takes place in the boiling space, when the necessary vacuum has been attained and the entering mixture of vapors bring sufficient heat into the heating cahmber. During this time the narrow nozzle through which steam is fed into the adsorber prevents the rapid driving off of the gasoline vapors, with the result that the peak load condition which is prevalent in the former cases is considerably ameliorated, and the aforementioned losses of gasoline are not incurred.

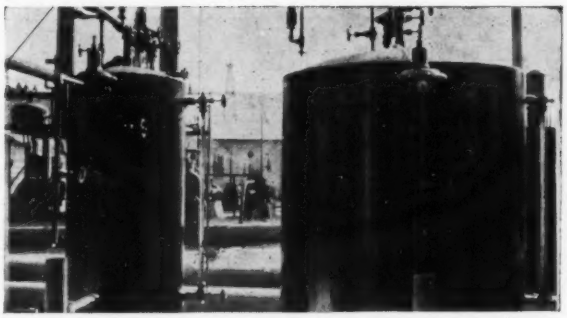


FIGURE 1
DRUMS USED FOR COLLECTING GAS SAMPLES FOR LABORATORY ANALYSIS

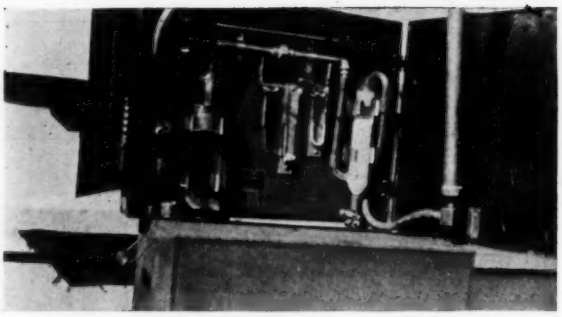


FIGURE 2
GAS ABSORBER INSTRUMENT, HUTCHINSON TYPE, FOR SAMPLING NATURAL GAS

Industry's Technicians Responsible For Extraction Methods

By GEORGE S. REID

THE natural gasoline industry is greatly indebted to its technicians, chemists and physicists for much of the rapidity of development of this phase of the petroleum industry, and especially the remarkable development of our present day highly scientific absorption gasoline extraction methods, may be directly attributed to the untiring efforts of the industry's technicians and engineers. During the past few years the industry has been presented with a multitude of improvements contributing to better economy and greater efficiency of operation. Such items of equipment as heat interchangers, preheating units, and distillation equipment have been subjected to much improvement and the perfection of such items as the stabilizer and various types of fractionating columns, not to say entire processes; the charcoal absorption process, for example; these and many more perfections of apparatus have been of great value and influence in the industry.

Concurrently with the development of commercial apparatus, the technicians within the industry have been making great strides in the perfection of instruments for their own use which are of much assistance in the work of control of gasoline plant operations. Among these highly specialized instruments which are of such great value to the chemist may be mentioned such devices as follows: The automatic oxygen control instruments, automatic gas specific gravity recorders, automatic gas calorimeters (recording), etc. The automatic feature of these instruments of precision lends a great advantage over the old types of manually operated instruments for similar work, and expedites the work of the chemist in his definite and accurate control of plant operation.

One of the most important tests prevailing with the laboratories of the modern progressive absorption gasoline plant operating companies is the frequent examination of the gas being processed, both before and after being treated, and the inspection of the absorption oil for saturation prior to and after the distillation procedure. The saturation test of the "lean" oil after it leaves the still is indicative of the amount of gasoline being removed from the oil in the distillation process and through such inspection the laboratory controls the evaporation or distillation procedure. The efficiency of the absorber tower is determined by frequent testing of the "fat" oil while it is en route from the absorber tower to the distillation unit and thus the efficiency or absorbing power of the oil absorbent is also determined and checked. The difference between the "fat" oil saturation and the "lean" oil saturation is an indicator of the plant production when computed upon the basis of oil circulated to the towers.

Wet and Dry Gas Tested

A second important test of widespread usage is the accurate determination of the gasoline content of the natural gas being treated—and this test is applied to both the incoming "wet" gas and the residue gas after it has passed through the absorption plant. Many plant operators have developed special apparatus for the collection of representative samples of the rich or wet gas before it enters the absorbers, and of the dry or lean gas as it leaves these towers. One of these installations is illustrated in the accompanying photograph, Figure 1—which is employed to collect a representative sample of gas for analysis each 24 hours. The two drums shown are filled with water, and then the small lines leading from the wet and dry gas mains are opened, which permits the wet gas to enter the small drum to the right of the illustrations, and the dry gas to enter the large drum at the left. The rate of gas accumulation is controlled by the valve on the water outlet line. The valve is opened just wide enough to permit just enough water to escape from the drums so that the gas displaces the water from each drum in 24 hours. The gas, of course, enters and leaves the absorbers at the operating pressure of the plant, and it is this pressure which effects the displacement of the water.

At the end of every 24 hour period the collected gas is measured from the drums through a meter and subjected to selective absorption in passing through the regular 250 c.c. of activated cocoanut charcoal; subsequently distilled in the presence of glycerine, and through this means the analysis of the two gas samples indicates the number of gallons of gasoline per thousand cubic feet of the natural gas being run through the plant—while the dry gas analysis is indicative of the efficiency of the absorber towers.

For sampling the natural gas a Hutchinson orifice meter and gas absorber is extensively employed. This instrument is shown in Figure 2. In this device the gas is passed through the pressure regulator and then through a platinum orifice plate to the charcoal cylinder which contains 250 c.c. of the activated chaircoal. The usual temperature rise method is used in sampling the gas, observation being made up to and including the fourth temperature rise at which point the tube of chaircoal is considered saturated.

Pressure Distillation

The tube is then closed tightly and

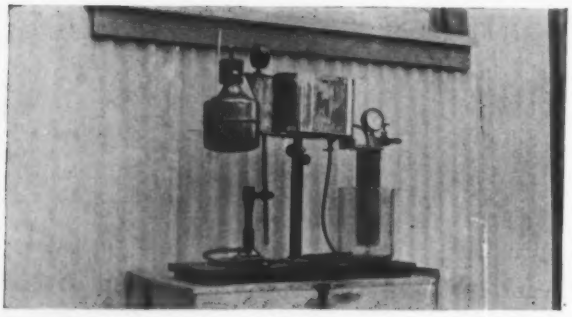


FIGURE 3
DISTILLATION INSTRUMENT FOR DISTILLING SATURATED ACTIVATED CHARCOAL UNDER PRESSURE

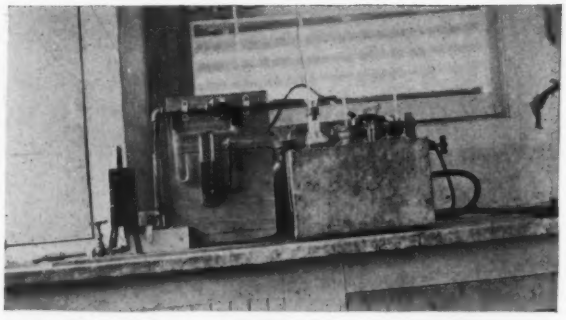


FIGURE 4
APPARATUS EMPLOYED FOR THE CARBON TETRACLORIDE METHOD OF TESTING CHARCOAL FOR ACTIVATION.

taken to the laboratory where the distillation procedure is followed under a pressure equal to the plant operating pressure. In Figure 3 is shown a pressure distillation unit of this type, which is all metal, steel jacketed, portable and an instrument of precision, called the Braun type. The saturated charcoal is placed in a copper flask with 200 c.c. of glycerine. Heat is applied after the flask is made up tight with a metal yoke. The usual 100 c.c. graduated cylinder is employed as the receiver, but having no lip. The receiver is enclosed in a wire jacket, for the protection of the operator in the event of breakage due to the operating pressure. The pressure is built up to about 30 pounds per square inch, and any excess pressure is released through a mercury sealed regulator. Distillation is carried on at this pressure until about 20 c.c. of the glycerine has been distilled—the temperature usually necessary being 550 to 600 degrees F. Then the volume of condensate is read, while under pressure, but the distilled volume of glycerine is disregarded, and the gasoline content is determined from that reading. The spent charcoal is washed free of glycerine by means of distilled water. The glycerine being water soluble, the solution is placed in a steam evaporator and the glycerine is recovered. This glycerine, though it is dark in color, is used repeatedly with no apparent harmful effects either to the charcoal or to the test yield.

Checking for Activation

The charcoal used in testing, after being washed free of glycerine is often reactivated and prepared for re-use. There are several methods of reactivation, which insure highly active gas-free carbon. Before the charcoal is re-used for testing purposes, however, it must be checked for activation—and this checking is usually done by the carbon tetrachloride method. The apparatus used for this work is shown in Figure 4. A specified amount of charcoal in a small tube represents a regular field type sample tube. The carbon tetrachloride vapors are carried to the charcoal by means of compressed air. First this compressed air is dried by passing it through three bottles of sulphulic acid, and then bubbled through three bottles of chemically pure carbon tetrachloride, which is immersed in an ice bath at 32 degrees F. The mixture of air and carbon tetrachloride vapors then pass through an accurately calibrated platinum office meter at the rate of exactly .027 cubic feet per minute, passing downward through the representative sample of charcoal being tested for activation. At the outlet of the miniature charcoal tube is a mixing chamber, through which is flowing ordinary plant dry gas, leading to a burner, in the flame of which is suspended a fine copper coil. When the charcoal being tested becomes saturated with carbon tetrachloride vapors, then the excess vapors are given off and travel down the tube to the mixing chamber, into the gas being supplied to the burner, and then travel with the gas up to the little copper coil, which is kept at white heat. These vapors then combine with the incandescent copper to form green copper chloride, which is visible to the eye as a green film. Very accurate determinations are made by observing the flame, etc., through a cobalt glass. The carbon tetrachloride time for good carbon is from 13 to 16 minutes. Multiplying these figures by three gives 39 and 48 minutes chloropicrin time—the chloropicrin test being the standard test method used by the government during the war for testing the carbon (charcoal) used for gas masks. The latter method, carbon tetrachloride, just described, has the advantage of being much faster and is just as accurate. Carbon testing below 39 minutes, however, is discarded as being inactive and it is then either thrown away or again activated.

For the computation of gas flow through the Hutchinson gas absorber used for the determination of gasoline content of the natural gas, it is necessary that the specific gravity of the gas be known. This is determined by instruments of precision, such as the Schilling gas bottle and the Edwards balance. The Edwards balance is an absolute and accurate method for determining the specific gravity of an unknown gas and is extensively employed by many companies where ac-

(Continued on page 64)

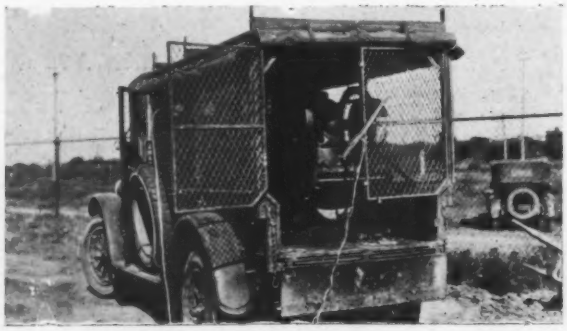


FIGURE 5
COMPRESSION TYPE OF TEST CAR USED IN THE MID-CONTINENT FOR TESTING GASOLINE CONTENT OF NATURAL GAS

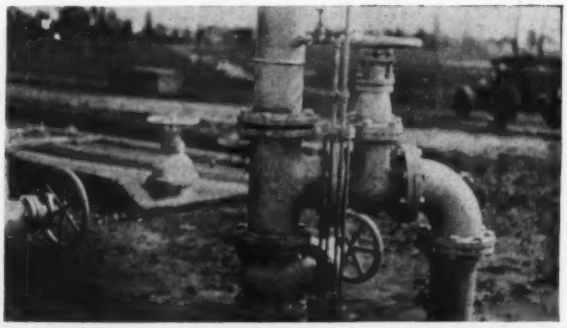


FIGURE 6
MANOMETER AND BLOCK VALVE DEVICE INSTALLED FOR REGULATION OF GAS FLOW INTO ABSORPTION TOWERS

Analysis of Ventura Avenue, California Crude

By GUSTAV EGLOFF and JACQUE C. MORRELL

Mr. Egloff has previously published the opinion that Ventura Avenue field will produce between 150,000,000 and 200,000,000 barrels of oil and rank fifth in total ultimate production and third in market value of the oil produced among all oil fields discovered to date in California.

The analysis of this oil for both the skimming plant utilization and for the cracking procedure, is timely, and of interest. The following discussion discloses the type and percentage of various products which are derived from crude produced in the Ventura field.

The Ventura oil selected for analysis had the following properties:

Analysis of Ventura Crude Oil

A. P. I. Gravity	29.5°
Furol Visc. at 77°F.	14 sec.
Cold Test	22°F.
Sulphur	1.00%

Products Derived from the Crude Oil

	Per Cent.
Gasoline	31.0
Kerosene	7.2
Gas Oil	19.8
Lubricating Oil	12.3
Paraffin Wax	2.7
Pitch Bottoms	25.0
Water	2.0

A. S. T. M. Analysis of Gasoline, Kerosene and Gas Oil Fractions of Ventura Crude

	Straight-run Navy Gasoline	Kerosene	Gas Oil
A. P. I. Gravity	54.7°	38.1°	30.6°
I. B. P.—E. P. °F.	128-433	387-527	514-777
Per Cent. Off	Temp. °F.	Temp. °F.	Temp. °F.
10	187	416	542
20	214	424	554
30	233	430	567
34			572
40	251	437	580
50	270	443	597
60	293	449	614
70	317	457	641
80	340	467	675
90	379	483	733
Over	97.5%	98.5%	98%
Bottoms	1.0%	1.5%	2%
Loss	1.5%		

Chemical analyses were made upon the gasoline to determine the percentages of the series of hydrocarbons by the method devised by Egloff and Morrell.[1]

Hydrocarbons

	Per Cent.
Paraffin	58.9
Unsaturates	4.9
Naphthene	32.2
Aromatic	4.0

[1]Journ. Ind Eng. Chem. 18, 354 (1926).

Ventura Topped Crude Oil

The Ventura topped crude oil used for the cracking tests was the residue after the gasoline fraction had been recovered by distillation. The Ventura topped crude had the following properties:

Gravity °A. P. I.	20.1°
I. P. P. °F.	435°F.
E. P. °F.	740°F.
Charge, cc	100 cc
Cold Test	61°F.
Flash—Cleveland	225°F.
Fire—Open Cup	260°F.
Furol Visc. 77°F.	135 sec
Condenser 60°F.	Water

Per Cent. Over	Temp. °F.
5	476
10	515
15	541
20	575
25	606
30	638
35	666
40	685
45	697
50	704
55	714
60	725
65	729
70	733
75	740
80	732
85	705
90	737
91.5	700

Over	91.5%
Water	Trace
410°-572°F	19.5%
Coke	7.8%
Sulphur	1.28%

Cracking Results

The cracking of Ventura topped crude was carried out at temperatures ranging between 810° and 860°F., and at 125 pounds pressure. The cracking tests were made to produce cracked distillate, coke, and incondensible gas in one mode of operation. Another type of cracking operation was conducted so as to produce cracked distillate, residuum, coke and incondensible gas.

The yield of Navy end point gasoline by the cracked distillate, coke, and incondensible gas mode of operation, called non-residuum type of operation, was 57.2 per cent. The total yield of gasoline derived from Ventura crude oil from blending straight-run and cracked gasoline was 68.6 per cent. When the pressure distillate bottoms were recracked, over 75.0 per cent of Navy end point gasoline were produced from the topping and cracking of Ventura crude oil.

A test was made on the basis of the residuum type of operation, producing cracked distillate, residuum, coke and incondensible gas. This mode of operation produced a yield of 48 per cent of Navy end point gasoline based upon the topped crude. A total yield of straight-run and cracked gasoline from the Ventura crude in this test was 62.5 per cent of Navy end point gasoline. The distillation analyses of the cracked gasoline derived from the non-residuum type of operation are tabulated as follows:

A. S. T. M. Distillation Analyses of Cracked Gasoline

	Non-Residuum Type Opr'n.	Residuum Type Opr'n.
Grav.° A. P. I.	53.5	54.4
I. B. P. °F.	119°F.	126°F.
E. P. °F.	439°F.	438°F.
Charge, cc	100 cc	100 cc
Condenser °F.	Ice & Water	Ice & Wat'r
Blending Ratio A/B		29.8/32.7
Per Cent. Over	Temp.°F.	Temp.°F.
5	153	157
10	175	178
15	193	196
20	213	211
25	229	224
30	244	236
35	258	248
40	273	260
45	285	271
50	298	283
55	309	293
60	321	304
65	329	314
70	343	325
75	356	341
80	368	356
85	383	371
90	398	389
95	418	413
98	439	438
Over	98%	98%
Bottoms	1%	1%
Loss	1%	1%

Chemical Analysis of Cracked Gasoline

Hydrocarbons—	Per Cent.
Paraffin	44.5
Unsaturates	20.4
Naphthene	12.1
Aromatic	23.0

The cracked distillates derived from the Ventura topped crude by the two modes of operation contained 0.68 per cent. of sulphur. This is a relatively high sulphur content for cracked distil-

late when compared with oils derived from other fields than those in California.

The chemical treatment of the cracked distillates designed to produce a water-white and light stable gasoline was as follows:

The cracked distillate was washed with 16° Baume caustic soda solution to remove the hydrogen sulphide and some of the mercaptans. It was then washed thoroughly with water and mixed with ten pounds of 66° Baume sulphuric acid per barrel. The sludge acid was allowed to settle and was drawn off. The oil was thoroughly washed with water. The cracked distillate was neutralized with approximately 1.5 per cent by volume of 16° Baume sodium plumbite solution and after thorough agitation was allowed to settle. The plumbite sludge was drawn off. The cracked distillate was then thoroughly washed with water and distilled with steam and fire to yield finished gasoline and gas-oil bottoms. The above refining of the cracked distillate produced a water-white, light-stable, doctor sweet, and non-corrosive gasoline containing 0.27 per cent. of sulphur.

The straight-run gasoline from the crude oil required only a sodium plumbite treatment to produce a product of a Saybolt color of +26. It was of negative corrosion test, doctor sweet, of good odor and had a sulphur content of 0.06 per cent.

A blend of the straight-run and cracked gasoline in the proportions in which they were produced by topping and cracking, passing general market specifications, contained 0.18 per cent of sulphur. To bring the cracked gasoline down to the market specfication of 0.1 per cent of sulphur would call for more drastic refining of the cracked gasoline.

The straight-run kerosene from the Ventura crude oil had a sul sulphur content of 0.35 per cent and is amenable to treatment by the Edeleanu sulphur-dioxide process which is in operation in several refineries in California. The sulphur dioxide treatment of kerosene stock produces a very high grade burning oil. Drastic sulphuric acid treatment will also refine the kerosene to market specifications.

Cracked Distillates

The cracked distillates after the chemical treatment outlined, were analyzed by the Hempel method of distillation so as to determine the percentages of gasoline and gas oil.

	Non-Residuum Type Opr'n.		Residuum Type Opr'n.
Grav. °A. P. I.	49.1°		53.3°
I. B. P. °F.	81°F.		84°F.
E. P. °F.	73.3% 435°F.	85.6%	440°F.
Charge, cc	800 cc		800 cc
Condenser °F.	Water		Water
Per Cent. Over	Temp. °F.		Temp. °F.
10	154		150
20	218		202
30	253		253
40	294		285
50	336		320
60	369		353
70	410		389
77.3	435		
77.5			410
85.6			440

The cracked-distillate bottoms derived from the cracking of the topped Ventura crude oil may be used for recycling stock, furnace oil, or Diesel engine oil. The distillation analyses for the cracked-distillate bottoms for the two types of cracking operations were made by the A. S. T. M. method.

Cracked Distillate Bottoms or Gas Oil

	Non-Residuum Type Opr'n.	Residuum Type Oprn.
Grav. °A. P. I.	26.9°	35.5°
I. B. P. °F.	436°F.	443°F.
E. P. °F.	666°F.	651°F.
Charge, cc	100 cc	50 cc
Condenser °F.	Water	Water
Sulphur	0.7%	....
Per Cent. Over	Temp. °F.	Temp. °F.
5	448	
10	456	457
15	460	
20	463	464
25	467	
30	472	471
35	476	
40	480	477
45	485	
50	490	484
55	494	
60	500	494
65	505	
70	515	507
75	522	
80	535	527
85	550	
90	578	566
95	610	
98	666	
99		651
Over	98%	99%
Bottoms	2%	1%

Cracked Residuum Oil

The cracked residuum produced from the pressure distillation of the Ventura topped crude oil passed all market specifications and analyzed as follows:

Grav. °Sp.	0.9672
Grav. °A. P. I.	14.8
I. B. P. °F.	397°F.
E. P. °F.	815°F.
Charge	100 cc
Flash—Cleveland	190°F.
Fire—Open Cup	225°F.
Furol Visc. 77°F.	21 sec.
Cold Test	Below 0°F
Benzol, B. S.	None
Condenser °F.	Water

Coke

The coke produced from the cracking reaction is of a honey-comb structure and rather dense. It contains approximately 10 per cent of volatile matter. The B. T. U.s per pound of coke are approximately 15,500. The non-residuum type of operation produced 60 pounds of coke per barrel, whereas the residuum type, without flashing the residuum, made 33 pounds of coke per barrel. The type of operations that involves flashing the residuum would give a yield of approximately 5 pounds of coke per barrel of topped crude oil.

Incondensible Gas

The incondensible gas produced by the two types of operation averaged 1300 B. T. U.s per cubic foot and amounted to 542 cubic feet per barrel of oil charged for the non-residuum type operation and 368 cubic feet per barrel for the residuum method.

Motor Tests Upon the Straight-Run and Cracked Gasoline

Motor tests were made upon the straight-run and cracked gasolines. The motor used for the tests was a Delco modified single cylinder, water-cooled head type which was fully described by Faragher and Hubner in the Journal of the Society of Automotive Engineers (Volume 20, page 405, 1927). The straight-run and cracked gasoline showed a value equivalent to 40 per cent benzol when using a Pennsylvania gasoline as a base to which pure benzol had been added.

Corrosion

The Ventura crude oil as received contained 1.00 per cent of sulphur and 2 per cent of water. The salt water present in the crude contained no calcium or magnesium chloride, but sodium chloride was present to the extent of 22.8 pounds per 1000 barrels of crude oil. In view of the absence of magnesium chloride, no precautions are necessary in distilling the Ventura crude oil to neutralize hydrogen chloride.

The topped crude oil used for cracking stock contained 1.28 per cent. sulphur, which, under cracking conditions, produced hydrogen sulphide and mercaptans. It would be desirable to neutalize the hydrogen sulphide resulting from the decomposition of the sulphur compounds. This may be accomplished by injecting hydrated lime into the cracking system at the rate of approximately one pound per barrel of cracking stock treated. The injection of lime into the cracking system not alone has a neutralizing effect upon the hydrogen sulphide, but also simplifies the cleaning of the heating tubes and the removal of coke from the reaction chamber, owing to the formation of a film between the coke and the inside surfaces of the heating and reaction elements.

Los Angeles, Calif.—The Western Oil & Refining Company, operating a 7000 barrel plant at Wilmington, Los Angeles harbor, with export terminals recently completed there, is now installing a Jenkins process cracking unit with a capacity rating of 800 barrels daily. The new unit is expected to be in operation some time during October.

Tests Show Interesting Data When Reducing Long Residiuum

THE present interest shown by refiners in the centrifugal dewaxing of long residuums and bright stocks and the refinery processing operations involved therein should make the present article a timely subject.

Long residuum is the name given in recent years to a residual bottoms containing either all or almost all the lubricant-containing fractions of the crude. It has a flash test, in some cases, as low as 390 degrees F. Usually, however, the flash on the average long residuum made by the refiner for centrifugal dewaxing will vary between 430 degrees and 470 degrees F. Long residuums or sharp stocks, hence, are distinguishable from cylinder or bright stocks by their lower flash, the latter class of oils ranging from 500 degrees to 575 degrees F. in flash test.

The detailed methods followed in the centrifugal dewaxing of oils by the Sharples process, undoubtedly, are well-known to every reader. Generally, the oil to be dewaxed is first acid-treated and filtered to the desired color and then placed in solution with a high gravity naphtha having a narrow boiling range. The percentage of naphtha to oil varies from a 55-45 ratio to a 70-30 ratio, depending upon the characteristics of the oil undergoing treatment and the cold test desired on the finished oil.

The oil-naphtha mixture is heated to about 110-120 degrees F. until all wax is in solution and all moisture has settled out, after which the mixture is transferred to a chilling tank. Here it is chilled to —10 to —20 degrees F. over a 48-hour period by means of cold brine, which is circulated through the coils at a temperature not more than 10 degrees F. lower than the oil. To insure an equal distribution of temperatures and precipitated wax, the oil in the chilling tank is turned over once each hour by a slow moving agitating device.

Bright Stock Easier

When the desired temperature has been reached, the chilled oil-wax-naphtha mixture is centrifuged at 15,000 r.p.m. in Sharples centrifuges. A wax-naphtha mixture issues from one opening of the centrifuge; an oil-naphtha mixture, from the other—each going to separate receiving tanks. Upon removing the naphtha, by distillation, the dewaxed oil produced by this process has a cold test ranging from 15 to 40 degrees F., depending upon the lowness of the temperature to which the oil-naphtha mixture was chilled.

Bright stocks are easier to dewax than long residuums or sharp stocks. This is because the specific gravity of the wax contained in long residuums is so much closer to the specific gravity of the oil-naphtha mixture used than is the specific gravity of the wax contained in bright stocks. For that reason either or both higher dilutions and naphtha of higher gravity are required for dewaxing long residuums as compared with that required for dewaxing bright stocks. It might be mentioned that the action of a high-speed Sharples centrifuge increases 13,000-fold the specific gravity of any mixture within the rotor of the operating centrifuge and consequently the *difference* in the specific gravity of each is increased by a like amount. It is because of this fact that Sharples centrifuges are able to remove, successfully, amorphous wax from oil-wax-naphtha mixtures.

Source of Neutrals

Since long residuums contain at least a part of the usually-made, wax distillate-containing cut of the crude, it is self-evident that, if the wax is removed from this fraction by centrifugal means, neutral oils of low cold test can be obtained by merely continuing the distillation after all the naphtha has been removed from the dewaxed long residuums.

A few refiners are thus making neutral oils from long residuum. When the amount of lubricating oil-containing crudes is limited, it is possible that this method of making neutral oils is economically feasible. But, in view of the fact that nearly all refiners produce excess quantities of wax distillate from which paraffin oils can be made more cheaply than by the centrifugal method, it is doubtful whether this method of making neutral oils will ever become an important factor in refinery processing operations.

However, the method of producing neutral oils in this manner by the distillation of dewaxed long residuums is an interesting one and the data shown in Table 1 are therefore given primarily for the purpose of illustrating the respective characteristics of the residual and overhead oils when continuing the distillation of a dewaxed long residuum (original flash test, 420 degrees F.) for the production of low cold test netural oils.

Diluted, dewaxed long residuum (obtained from a mixture of Craig, Colo-

TABLE I

Results of Tests on Overhead Distillates and Residual Bottoms when Reducing Dewaxed Long Residuum to 140/210 Viscosity Bottoms

Time when sample was taken, when first cut into 6Tk.		DISTILLATE Gravity	Flash	Fire	Vis/100	Vis/ 210	Color	Cold Test	BOTTOMS Still Temp.	Flash	Fire	Vis/100	Vis/210	Cold Test
2:20 A.M.	2-5	30.1	220	240	47	1½	—2	16	455	415	485	660	68	34
3:00 A.M.	"	29.4	245	285	53	1½	—2	26	455	420	485		68	34
3:30 A.M.	"	29.2	260	310	60	1¼	—2	30	465	425	490	681	69	34
4:00 A.M.	"	29.1	265	315	67	2	—	32	475	425	490		69	34
4:30 A.M.	"	28.9	290	340	71	2	—	33	480	425	490		69	32
5:00 A.M.	"	28.8	300	360	75	2	—	34	485	430	490		69	32
5:30 A.M.	"	28.8	305	370	76	2	—	34	490	425	495		71	32
6:10 A.M.	"	28.7	315	380	81	2	—	34	495	425	490	713	71	32
6:30 A.M.	"	28.6	325	395	86	2	—	35	500	430	490		71	32
7:00 A.M.	"	28.7	340	400	87	2	—	36	505	435	495		72	30
7:30 A.M.	"	28.4	350	405	93	2	—	36	510	435	500		72	32
8:00 A.M.	"	28.3	350	405	94	2	—	36	510	440	500		73	28
8:30 A.M.	"	28.2	355	410	96	2	—	36	515	440	505	775	73	28
9:00 A.M.	"	28.2	355	410	96	2	—	36	515	445	510	798	73	30
9:30 A.M.	"	28.1	355	420	101	2	—	37	520	445	505	808	74	30
10:00 A.M.	"	28.1	355	420	101	2	—	37	520	445	505		75	28
11:00 A.M.	"	28.0	355	420	107	2	—	36	525	440*	505	505	75	28
12:00 M.	"	27.9	365	435	117	2	—	36	530	450	515		78	28
1:00 P.M.	"	27.7	365	435	118	2	—	35	...	450	515		78	28
2:00 P.M.	"	27.6	365	440	129	2	—	36	...	450	515		80	26
3:00 P.M.	"	27.5	365	440	140	2	—	35	...	455	515		82	25
4:00 P.M.	"	27.4	375	440	148	2	—	36	560	460	525		85	25
5:00 P.M.	"	27.0	385	450	159	2	+	36	565	460	525		87	26
6:00 P.M.	"	26.8	395	460	178	2	+	35	570	470	535		92	25
7:00 P.M.	"	26.9	400	465	187	2	+	36	580	475	545		95	25
8:00 P.M.	"	26.9	405	470	197	2	+	35	590	475	545		99	22
9:00 P.M.	"	26.3	405	475	231	2½	+	32	600	490	555		105	22
10:00 P.M.	"	26.0	410	480	246	2¾	+	33	610	490	555		112	22
11:00 P.M.	"	25.8	410	480	281	3	—	30	625	495	565		119	22
12:00 Midnight	"	25.7	415	495	302	3	+	30	635	505	580		131	22
1:00 A.M.	2-6	25.7	415	495	335	3½	+	30	...	515	595		140	21
2:00 A.M.	"	25.3	420	515	393	4	—	30	...	...	...		...	..

*Flash checked 5 times at 440° F.

rado, and Lost Soldier, Wyoming, crude oils) made by the Sharples process, following the general procedure previously described, was charged to a 600-barrel still semi-continuously and the naphtha removed therefrom. When the still was about two-thirds filled with oil, semi-continuous charging was stopped and the oil was reduced by batch distillation, using both fire and steam, until a residual oil (bright stock) having a viscosity of 140-210 degrees F., was obtained.

Sixteen samples were obtained, at half-hour intervals, of both the overhead distillate and the residual oil, after which 16 additional, similar samples were obtained at hourly intervals. At the end of this time, the residual oil was the desired viscosity.

The reader is referred to Table 1 for detailed data concerning the results of laboratory tests on both the overhead and residual oils.

Particular attention is called to a comparative study of the "cold tests" on samples of both products taken at the same time. Up until the 4:30 a.m. sample was obtained there was a small amount of heavy naphtha ends yet present in the overhead distillate. This is indicated by the flash test and the lower cold test on the first four samples examined: 16, 26, 30 and 32 degrees F., respectively. Thereafter, the cold test of the overhead oil, steadily, was higher than the residual product and, in one case (8 p.m. sample), there was as much as 13 degrees F. difference between the cold tests on the two samples. It is possible that this is due to the changing, during distillation, of low-boiling paraffins of amorphous characteristics into paraffins of crystalline characteristics with the corresponding tendency to increase the cold test of oils in which they are present.

Industry's Technicians Responsible for Extraction Methods

(Continued from page 60)

curate gravity determinations are essential.

In testing producing oil wells by the charcoal method of gas analysis a complete test car is maintained, which is equipped with a Vernon vacuum pump that is fastened to the engine frame and belt driven from the fan pulley. The vacuum pump overcomes approximately 10 inches of well vacuum and discharges the natural gas at pressures high enough to run the charcoal and specific gravity test. This test is extensively employed on the West Coast, while in the Mid-Continent area the compression test is more or less standard. Figure 5—illustrates the type of customary compression testing wagon as used in the latter area. The equipment is essentially a complete compression gasoline plant in miniature.

Manometer Control

Another interesting control device developed by the engineers of the gasoline manufacturing industry is the employment of the manometer for regulation of the flow of gas into the absorber towers. This feature is illustrated in Figure 6. The manometer is employed to indicate the comparative flow of gas into each absorber on a given plant for the purpose of controlling, as nearly as possible, the volume of gas to be handled by each absorber and to keep each absorber operating under the same conditions as to velocity, pressure, temperature, etc. A manometer is placed on each line leaving the main gas header line—which conduct the rich gas into the absorber towers, as is shown in Figure 6. On the plant operator's daily report the indication in inches, as read hourly on each manometer, is recorded. Control of the volume of gas entering each absorber tower is secured by regulating with the block valves placed on the gas inlet lines—as shown in the figure behind the manometer. The flange placed between the two small lines leading to the indicating instrument (the manometer), houses an orifice plate. In this manner each absorber tower in the series is regulated and controlled so that they are all treating a like volume, or number of cubic feet, of gas daily.

To control the volume of lean absorption oil entering the series of towers, so that each tower receives a like or controlled amount of this liquid, there is usually a series of block valves installed, but in addition there is generally used a separate oil meter for each absorber tower—and this meter measures the oil into the absorber. The object of such control is to assure that at no time will any one tower be overburdened with rich gas, or flooded with lean oil, or under-supplied with either of these substances.

Although the chemists and engineers of the industry have developed many improvements with great rapidity in the past and have accomplished results which are nothing less than remarkable, it is confidently expected that much more noteworthy improvements and developments are to be forthcoming in the near future, in both control methods and in the perfection of more efficient gasoline extract—in apparatus. The manufacturers of natural gasoline are seemingly blessed with a co-operative spirit, and with a proclivity for interchanging ideas and experiences, and this attitude in the past has been conducive in a large way to the development of the gasoline industry into a highly scientific business, and no doubt, through the same attitude the industry will be benefited in the future.

Recondition Plant

Thermopolis, Wyo.—The Utah Oil Refining Company has workmen on the grounds reconditioning its newly acquired refinery, which was formerly the plant of the Alliance Oil & Refining Company. The plant is being remodeled and put in shape for operation by the new owners. The Utah Company controls crude oil production close by in its Black Mountain structure, where it has some shut in production, which will be processed through the plant rebuilding.

New Gasoline Plant

Shreveport—Louisiana Oil Refining Corporation began construction of its absorption gasoline plant in the Cotton Valley field during the first week in August. This plant is being constructed mostly of material salvaged from a gasoline recovery installation formerly in operation at the company's Bossier City refinery, which was dismantled some time ago and new larger and improved recovery plant installed. The plant will have a capacity of about 12,500,000 cubic feet of gas daily.

Greases and Their Manufacture

(Continued from page 56)

remainder of the mineral oil containing the soluble organic dye. A good sponge grease should contain approximately 20 per cent soap.

Fibre Greases

In the manufacture of sponge greases, the point at which the mass has balled into long interwoven fibres, if prolonged stirring at a temperature of 210 degrees F is carried out, the long interwoven spongy mass will break up into short fibres; hence, a fibre grease may be made from a sponge grease by following the above instructions. Fibre greases of various consistences may be made by decreasing or increasing the amount of mineral oil used in finishing the grease.

Graphite Greases

These greases are usually made from cup greases, (the manufacture of which has already been discussed) with the addition of mineral oil and finely powdered graphite. They are not difficult to make. Formula:

310 gals. Light Cup Grease.
25 gals Light Paraf. Oil (100 vis @ 100 degrees F. Saybolt.)
125 lbs. Fine Graphite.

The cup grease and mineral oil are mixed together and warmed sufficiently to make a dilute paste; and while agitation is going on, the fine graphite is added gradually, care being taken that the graphite remains suspended, also that the paste is homogeneous after all the graphite has been added. Allow to cool while stirring. This type of grease is highly desirable where heavy friction occurs.

The subject of grease making is so broad, due to the fact that hundreds of special greases can be made from the knowledge already obtained, that the writer deems it unnecessary to go into detail regarding their manufacture. The same general procedure for making special greases is employed, with the exception of a few modifications and components, depending on the kind of grease desired and the purpose for which it is to be used.

Greases are an article of necessity and great demand. Such an important part do they play in the subject of lubrication that too much concentration and research cannot be exercised in their manufacture.

All-Metal Laboratory Still Easily Made

IN many refinery laboratories crude oil analysis is carried out in pyrex glass retorts of the familiar Hempel and Engler types. These stills are usually limited in size and volume of charge to one and two liters, or 1000 and 2000 cubic centimeters of oil. Ordinarily 2000 cubic centimeters of charge to the glass flask is about as much as can be safely handled. Work with this small amount, however, is often accompanied by a flattening of the glass retort bottom, especially where extreme temperatures are employed. Another handicap presented by the glass retort lies in the fact that residuum resulting from low reduction practices is usually very difficult to remove from the still. The larger glass flasks become a fire hazard of some importance when larger samples of crude are distilled to very low residuum by direct fire methods.

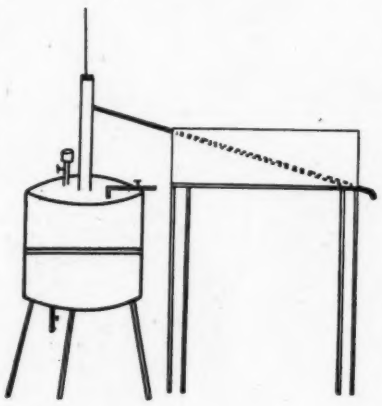
A very economical all-metal retort has been devised by petroleum physicists working in conjunction with the Bureau of Mines. This still may be constructed of material obtainable from the plant yard, and fabricated by the refinery welder to make a highly efficient laboratory distillation unit of sufficient size to yield sufficiently large in volume for further treatment and analysis. The advantage of charging a larger amount of crude to the still lies in the recovering of enough condensates to weigh up accurately, to determine the color, to chemically treat the fraction and to make the subsequent distillation record of the distilled product.

The still, which might well be termed a home-made apparatus, is designed and constructed so that it may be converted almost instantly from a Hempel type retort into an Engler distillation unit.

"Home-Made" Affair

The still is constructed according to the following specifications and entirely from pipe and iron usually found about the plant yard. The capacity of the still for usual laboratory work should be around 3000 cubic centimeters or three liters. This capacity is acquired by cutting a 10-inch section of eight-inch iron pipe. end by welding on a flat piece of iron about the same weight as the pipe used for the cylindrical shell. A two-inch opening is left in the center of the top plate of the still. Into this opening a section of two-inch iron pipe 14 inches in length is welded, forming the dephlegmator or tower. The top of the two-inch "tower" is closed with an ordinary pipe cap, in the center of which is cut a half-inch hole for the insertion of the thermometer.

Dropping two inches from the top of the tower, the vapor outlet is welded in at an angle conforming to the specifications of the A. P. I. and Bureau of Mines. This vapor line leads to the condenser box.



At the top shell of the still there should also be placed a quarter-inch nipple and valve, providing for the introduction of steam, if this is desirable. For the purpose of receiving the charge of oil, another opening is provided in the top of the still. This is generally three-quarters of an inch in size, into which a nipple is inserted, and a good valve provided at the top of the nipple. The charge may then be funneled into the retort.

A three-quarter-inch opening, provided with nipple and valve, is placed at one side of the bottom of the still for the purpose of draining the residuum from the retort for testing after the distillation is completed.

The entire still, with the exception of a bottom plate and the connections and the dephlegmator section, is well insulated with asbestos or some other suitable insulating material.

Condenser Box

The condenser box dimensions specified for this distillation unit are 24 inches in length, with a width of six and one-half inches and a depth of six and one-half inches, generally constructed of tin. Supports for the condenser box can be made of angle iron. This requires, usually, four 26-inch lengths. The condenser coil also conforms to the specifications of the A. P. I. and Bureau of Mines.

Jack chain of the usual size and length is employed in the tower for fractionation purposes when the Hempel distillation is required. Removal of this chain effects a straight Engler distillation.

The still is not as elaborate as the ordinary retort of one-barrel capacity found in most of the miniature laboratory installations employed to duplicate plant conditions. In its simplicity the retort is much easier to operate and much cheaper in construction. An additional advantage lies in the fact that this small but efficient retort can be set up on the laboratory table, for it does not require much space. Table space of 42 inches by 14 inches is sufficient for its operation. Results are more accurate than the usual one-barrel unit, and the disadvantages of the glass retort are entirely eliminated.

An example of the size of fractions obtained from the distillation of North Texas crude oils may be of interest. When 3000 cubic centimeters of this crude is charged to the still at least 1000 cubic centimeters may be recovered in the U. S. motor fuel cut or fraction. About 250 cubic centimeters is recoverable as kerosene in the second cut.

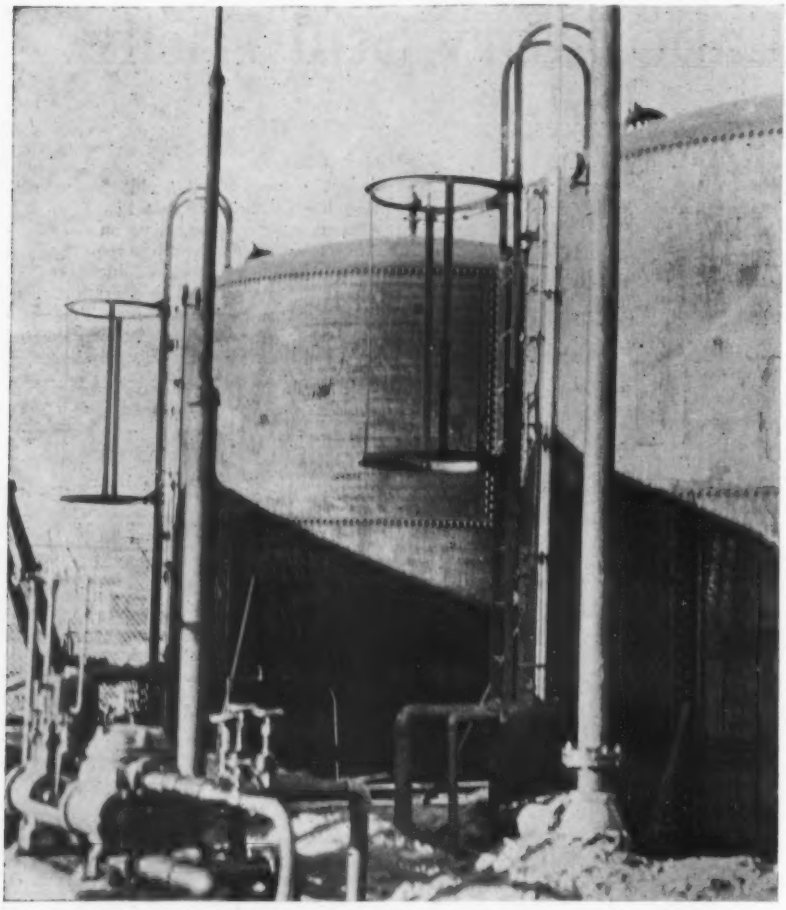
Both of these fractions are of sufficient volume to accurately weigh up, treat or otherwise handle in general laboratory inspection. The distillation may then be carried on to extreme temperatures for the recovery of gas oil or cracking still charging stock content, without damage to the all-metal retort. The remaining residuum is then easily drawn off through the bottom outlet for inspection.

The percentage of recovery of such fractions as light and heavy gasoline, naphthas, kerosene and gas oil are of course governed by the type of crude oil being analyzed, and the temperature at which such cuts are made are determinable only after the laboratory operatives are familiar with the crude oil being tested. The still is also of value in accurately determining, through larger charges of oil, the percentage or content of gasoline present in pressure distillates derived from whatever type of cracking unit is in operation on the individual refinery.

New Refinery Company

Sweetwater, Texas—The Sweetwater Refining Company has been incorporated under the laws of Texas with a capital stock of $25,000 by J. H. Travis, A. R. Stribling and J. C. McClure, and has resumed operation of the small skimming plant located at Sweetwater. The plant is handling about 300 barrels of crude daily, and obtains same from West Texas fields.

Parco, Wyo. — The Producers & Refiners Corporation expects to have its new battery of Dubbs units turned over to them for operation about September 1. Four units of the new type are practically complete. The 40-foot expansion chambers are in place for all six of the new units which the company expects to be in operation later in the fall.



GASOLINE STORAGE TANKS OF THE RICHFIELD OIL COMPANY AT HUNTINGTON BEACH, CAL., EQUIPPED WITH ONE TYPE OF SAFETY GUARDS ENCIRCLING THE STEEL LADDERS

Safety Guards On Refinery Tanks

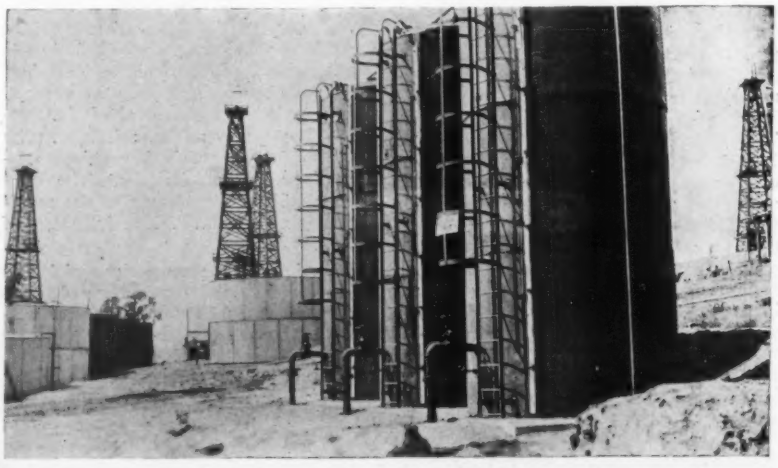
AMONG the worth while devices installed as a measure of safety provision in refineries and natural gasoline plants is the so-called "safety guard," to be attached to the vertical mounting ladders on all steel storage tanks. These safety guards, as shown in the accompanying illustrations, are gaining widespread usage in the manufacturing end of the petroleum industry. They are installed near the top of the tanks, encircling the steel ladder provided for climbing up to the gauging and sampling hatch. In this position they are utilized as a brace against which the employe may safely lean when in need of support while his hands are busy in the act of gauging or sampling the tank. The strap steel of which they are assembled is of sufficient weight to easily bear the weight of the operator who must use them, and are sufficiently heavy to break the fall of a man, in the event of slipping, without getting out of shape or bending under the strain. In cold climates, during the winter months, when the rungs of the ladder, and the risers extending above the tanks are covered with ice, snow and sleet, and the top of the tank is slippery beyond comparison, the safety of the "sample grabber" and the tank gauger is greatly increased through their use.

A fall from a small run down tank, or a 10 or 15 foot storage tank often injures the employe to such an extent as a sprained ankle, or a broken leg or arm, which in itself is serious enough to justify the installation of such safety devices as are pictured above.

The guards as shown in the illustration are installed on natural gasoline storage tanks in the Southern California fields, where wet weather is about the worst in which the employe must work, but even water on steel renders it slippery and unsafe, and while the danger of accident is therefore less, the owners of plants in this district feel that the additional expenditure of money necessary to make tank gauging and sampling much safer, is easily justified. The stout cages, or guards, lend convenience to the work of correctly measuring tank contents. Several California plant operators make it a practice in following out the policy of employing all types of safety guards and measures to equip all tanks having vertical ladders with cage guards of the type shown.

Rebuild Burned Plant

San Angelo—The San Angelo Refining Company, whose plant was seriously damaged by fire during the latter part of July, plans the immediate rebuilding of the destroyed equipment and other improvements. According to R. P. Humes, vice president of the company, the estimated damage to the plant is between $50,000 and $75,000. The fire destroyed about 2500 barrels of crude and refined products, two 1000 shell stills were damaged, condenser, vapor lines, receiving house, run down tanks and the pump house and equipment were ruined. A new pipe still which had not yet been placed in operation was rushed to completion and started operating soon after the fire. Mr. Humes stated that rebuilding of the equipment and damaged portions of the plant was to be hastened to completion, and that the capacity of the installation was to be increased from 200 to 3000 barrels.



ANOTHER TYPE OF SAFETY GUARDS PLACED ON THE VERTICLE LADDERS ON STEEL STORAGE TANKS OF THE RIO GRANDE OIL COMPANY'S GASOLINE PLANT

Length 37 feet—Inside diameter 10 feet. Wall thickness 2½ inches. Weight 129,000 lbs.

Safety and Savings by Smith

Because of the completeness and magnitude of the A. O. Smith Corporation's equipment and plant, Smithsteel Cracking Vessels can be obtained in less time than cracking stills made by other methods.

The fabricating methods used assure remarkable accuracy. You can, therefore, prepare super-structure, piping, etc., in advance with absolute certainty that Smithsteel Cracking Stills will fit.

Size of Stills

Smithsteel Cracking Stills can be built to any diameter and length within transportation limits—and in any wall thickness within steel mill capacity.

Safety

Smithsteel Cracking Stills have a continuous record of successful operation in the field under the most exacting and varied conditions.

Every Smithsteel Vessel is tested not only with reference to operating conditions but is subjected to pressures which may be three or four times as great as those which the vessel will encounter in actual operation. These tests are invariably made in the presence of purchasers' representatives.

Cost

Smithsteel Cracking Stills do cost more than vessels made by some other methods. The extra cost is the price of safety.

Only the Finest Part of the Ingot is Used

To get the quality demanded for Smithsteel Cracking Stills, 50% of the ingot metal has to be scrapped. An additional 10% is scrapped in the building of the still.

Only 40% of the ingot is good enough for Smithsteel Cracking Stills.

Throughout the process of manufacture the steel is closely inspected. The slightest evidence of a defect in a plate sends it to the scrap pile.

Each vessel is made of small sections every one of which can be inspected and will be rejected if it does not come up to Smithsteel standards.

A. O. SMITH CORPORATION :: *Milwaukee, Wisconsin*
Oil Field Products Division Los Angeles

Arizona Halloysite Suitable for Clay Pulp Contact Filtration

By H. L. KAUFFMAN
Petroleum Chemist, Denver, Colo.

OF extensive interest during the past three years is the clay-pulp process of filtering lubricating oils as developed by Carl J. Von Bibra and Paul W. Prutzman of the General Petroleum Corporation, Los Angeles, California, and by the engineers of Max B. Miller and Company, 501 Fifth Avenue, New York City, N. Y. Patents covering this process are owned by the Filtration Processes Company, Max B. Miller and Company having been appointed the executive agent throughout the United States for the Filtration Processes Company.

Several refineries in the Mid-Continent region are using the clay-pulp method of contact filtration, while additional refineries both in the Pennsylvania and California regions either have same already in use or have contracted for an early installation.

One objection to the more rapid use of this method of filtration in the Mid-Continent has been the high freight rate that the refiner has to pay on the raw clay before it reaches his refinery; for, at present, in this process the clay—in reality a clay-mineral known as montmorillonite—is brought from a point below San Diego, California, and hence, because of this long haul, has a high cost.

Recent discoveries in the Eastern part of Arizona of large deposits of a clay-mineral as halloysite, having an extremely high decolorizing value when given an acid treatment and applied to the oil as a clay-pulp in a manner similar to that followed in treating and using the California montmorillonite, make it appear that in the not far-distant future Arizona may prove to be another source of the raw material used in the clay-pulp method of filtration.

The economy and success of this process depends upon the fact that thereby clays of very high decolorizing and deacidifying powers can be utilized, and by so doing a material reduction in the cost of filtering lubricating oils is effected. These "high-powered" clays (which are treated with sulfuric acid and water washed until free of the products of the reaction) are from five to ten times as efficient as "100-up-mesh" Florida or Georgia fullers earths.

Although this process is equally applicable for use in filtering viscous neutrals, long residuums or bright stocks, it is more successful in the filtration of long residuums and bright stocks. This is due to the fact that on the latter class of oils a color can be obtained by the use of a small amount of these high-powered clays that cannot be duplicated by the use of any reasonable amount of 100 or 200-mesh fullers earth; and, in some cases, a color that cannot be matched by the use of fine fullers earth in any quantities whatsoever.

Essential Features of Process

Since some readers may not be thoroughly familiar with this method of contact-filtering lubricating oils, the essential features of the process are given in the paragraphs following, and, for convenience, are mentioned according to the operating steps followed.

1. The oil is acid-treated in the usual manner, using such an amount of acid that will give a reduction in the color of the oil at a cost that is less than that of filtering to a similar color. In other words, it is advantageous to obtain a balance in the amount of acid and clay used to secure a certain color, taking into consideration the cost of the acid and of the clay and the losses incurred by the use of each in obtaining that particular color. This is a matter for laboratory experimental work in determining the most economical acid and clay treatment in reducing a particular oil to the desired color.

2. The oil, after having been withdrawn from the agitators, may be clarified, if required, by being allowed to settle in tar-settling tanks, until the presence of "peppery" sludge in the treated oil has been reduced to a minimum.

3. The raw clay is treated with sulfuric acid, washed with water, and allowed to settle until it reaches the condition of a slime or pulp.

4. A clay-oil-emulsion is prepared by mixing together, in a lead-lined tank, the wet-clay pulp (mud) and acid oil (from the main batch of oil to be filtered) in 50-50 ratio. This gives a permanent and stable emulsion, thereby holding the clay in suspension and facilitating its subsequent handling by pumps.

5. By previous laboratory experiment, the quantity of clay pulp required to give the necessary bleach to the whole batch of acid oil (or whatever quantity of oil is to be handled) is ascertained. Knowing the ratio between the volume of the clay-oil-emulsion and the volume of the main batch of acid oil remaining, each is now delivered by separate pumps in this ratio into a heating element.

An alternative method is to make use of an emulsion tank equipped for mechanical agitation, in which case the clay-pulp (with no acid oil added thereto) and acid oil (from either the agitator or tar-settling tank, as the case may be) are pumped in a pre-determined ratio by separate pumps into the emulsion tank—therein being mechanically agitated—and then pumped from this emulsion tank into the heating element.

The heating element preferred is a pipe-still, wherein the oil-clay-pulp is raised to a temperature at which both the water will be driven off and a maximum decolorizing and deacidifying efficiency be obtained from the clay. The temperature at which the clay shows its greatest efficiency usually is that at which there first takes place a slight decomposition (tendency to distil) of the oil.

6. The mixture of oil and clay left after the water has been driven off is discharged into a so-called oil or vapor separator, and therein thoroughly steamed for the removal of lighter vapors. It is usually desirable to have the vapors coming off from this separator pass to a suitable water-cooled condenser.

7. The steamed mixture of clay and oil is filtered for the removal of the spent clay. Any suitable type of filter press may be used.

8. The filtered oil passes through cooling coils, thence to a small run-down tank and thereafter to storage.

9. The filter cake, if desired, may be treated for the recovery of the oil contained therein. If the presses have been erected on the second floor of the filter house, the cake is allowed to drop by gravity into trucks or dump cars. However, if the filter presses are placed on the first floor of the building, then it becomes necessary to use conveyors of a suitable type for the removal of the filter cake.

The above described steps are the principal stages of the clay-pulp method of filtering lubricating oils.

Preparation of Treated Clay

Of interest also, in addition to the description already given, is the procedure followed in preparing the treated clay; and since such clay is treated at the refinery, the method of preparation is an essential feature of the process.

Crude lump clay is unloaded from cars into a clay bin, and from there it is transferred by a belt conveyor to a pulverizer. Any suitable pulverizer that will grind the clay, economically, to a 200-mesh fineness can be used. From the pulverizer the ground clay passes to a "ground clay" bin.

In the meantime, the required amount of 66 degrees Be. sulfuric acid and water have been mixed together in a lead-lined cooker. This acid solution contains 20 per cent by weight of sulfuric acid. From 0.4 to 0.5 of a pound of 66 degree sulfuric acid per pound of dry clay is a suitable quantity. The exact amount of acid to be used depends upon the increase in the adsorptive efficiency of the clay with an increase in the amount of acid used; in other words, there is an eco-

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nomical point at which it is not advisable to use more acid in treating the clay.

When the acid solution has been brought to the required 20 per cent strength, and the proper amount of acid is in the cooker for the treatment of a given quantity of clay, then the desired amount of ground clay is automatically weighed and transferred into the clay cooker. A splash plate near the top of the cooker serves to distribute the clay over the surface of the acid-mixture and thus prevents the formation of lumps. Air under sufficient pressure to overcome the hydraulic head is admitted through the cone of the cooker, and the mass is kept agitated during the addition of the powdered clay and for some time thereafter.

When the clay has been thoroughly mixed with the acid, exhaust steam is admitted to the jacket and to the space below the cone of the cooker. The batch is agitated at intervals to keep the clay in suspension during the early part of the "cook". After from four to six hours, most of the acid solution has been absorbed by the clay, forming a pulp that does not require further agitation. The "cook" is usually complete in from six to eight hours, but to prevent irregularity in quality it is desirable to allow the batch to "soak" for from 18 to 24 hours.

At the end of that period of time the cooker is filled with water—agitating the mass during the addition of the water—after which the whole is pumped to a water-wash tank, allowed to settle, and the supernatant liquid pumped off and wasted.

The treated clay is then washed for from four to five times, each time agitating the clay with 180 degree F. temperature—water, settling, and pumping off the supernatant liquid—the process being repeated until the acidity of the mass has been reduced to a minimum.

Typical Samples

Upon completion of the last wash, the clay is allowed to settle until it is as thick as can be handled readily by a pump—this corresponding to a pulp containing about 25 per cent of solids. The clear water, then, is pumped off as closely as possible, while the remaining pulp is pumped to the "pulp storage tank", from which it is drawn when needed for use in the process.

Two samples of Arizona halloysite were examined by the writer, and the remainder of this article therefore constitutes the results of an exhaustive series of filtration tests on these two samples.

Halloysite No. 1 was an average sample taken from a 320-acre deposit in which appeared two ledges of halloysite: a top ledge ranging from three to four and one-half feet in thickness and a bottom ledge varying from two to three and one-half feet in thickness. This sample disintegrated quickly in water making grinding unnecessary. Before being used in these tests in an untreated form, however, it was dried and screened to 100-mesh fineness. This sample possessed very marked collodial properties and, consequently, was slow-settling in washing procedures. However, the rate of flow of oil through the sample, either when the halloysite was used untreated or treated by any method, apparently was equally as rapid as that shown by the same oils when filtered through "100-up" mesh Florida or Georgia fullers earth.

Halloysite No. 2 was an average sample taken from another 320-acre deposit in which the ledge at the outcrop was about six feet in thickness. This sample did not disintegrate in water and hence had to be crushed and screened before it was used in an untreated form in the laboratory tests.

Treating

Sample No. 1, of 100-mesh fineness, was compared in its raw state with Georgia fullers earth of the same mesh; and further comparisons thereafter made between the same grade and mesh of fullers earth and Halloysite No. 1 after having been given five different treatments, as follows:

1. *Water Treatment.* A sample of the ground clay, 100-mesh fineness, was washed with four successive portions of 180 degree F. temperature water, using on each wash an amount of water that was equivalent to one gallon of water to one pound of clay so washed, agitating thoroughly, and each time allowing the clay to settle to a maximum density before siphoning off the supernatant water and then repeating the washing action.

Seventeen hours was the total settling time required for this clay sample and there was a recovery of 87.6 per cent. This percentage figure was ascertained by an analytical determination of the amount of water in the washed clay-plup and then using this result, having previously found the total weight of clay-plup, to calculate the percentage recovery on a net dry basis of washed clay.

In subsequent discussion and in the tables the clay from this treatment hereafter will be referred to as "Raw Pulp".

2. *Five Per Cent Dry Acid Treatment.* This treatment was carried out by stirring five per cent by weight of concentrated sulfuric acid into the raw clay, 100-mesh fineness, while agitating the clay thoroughly. To obtain a more intimate mixture this clay was then put through the grinder twice before using.

This treated sample will be mentioned hereafter as "five per cent Dry Acid Treated."

3. *Five Per Cent Acid Treated Pulp.* A sample of the finely ground clay was digested for five hours at 200 degrees F. with a mixture of five per cent by weight of concentrated sulfuric acid and sufficient water to give a pouring consistency. This pulp was then used without washing out the reaction products.

This sample will be referred to hereafter as "5 Per Cent Acid Treated Pulp."

4. *Five Per Cent Acid Treated, Dried.* One-half of the pulp made in the manner described under "3" was dried at 230 degrees F. and used in making filtration tests designated by "5 Per Cent Acid Treated, Dried."

5. *Fifty Per Cent Acid-Treated Pulp.* In preparing this acid-treated pulp, 66 degrees Be. sulfuric acid was added to the finely-ground clay in an amount equal to 50 per cent by weight of the clay. Enough water then was added to give an acid concentration of 20 per cent, the whole thereafter being digested, under a reflux condenser, for five hours at 200 degrees F. The pulp was then washed with four successive portions of 180 degrees F. temperature wash water, using an amount of water on each wash equivalent to one gallon of water per pound of clay. After the addition of each portion of wash water, the whole was thoroughly agitated and then allowed to settle until the supernatant liquid was practically clear, after which the clear liquid was siphoned off, a fresh portion of wash-water added and the operation repeated. Nineteen hours was the total settling time required for this particular treatment, while the recovery of treated clay was 73.8 per cent.

This sample hereafter will be referred to as "50 Per Cent Acid-Treated Pulp."

Since the method used in determining the efficiency (as compared with 100-mesh Georgia fullers earth) of the halloysite samples here being discussed is practically the same as the method described so adequately by A. R. Moorman, Engineer for Max B. Miller and Company, at the Oklahoma Section Meeting of the American Chemical Society at Tulsa, Oklahoma, on April 25, 1925, and as further comments on the part of the writer concerning the method are deemed unnecessary in the present article, Mr. Moorman's description is quoted below in full:

"The efficiency of a clay means of course, its relative decolorizing power. As this relative value of two or more clays will vary with different oils, it must be determined for each individual case. This can best be determined in the laboratory by contacting the same oil to the same color, using any number of different clays. Assign a unit value to any one of the clays and the efficiency ratio of the others is readily determined.

"For instance, if it takes 20 grams of finely-ground fullers earth per 100 cc of oil to give a desired color, and four grams of any other clay to obtain the same color, then the efficiency of the latter is five.

"The following method of testing clays in the laboratory is simple and should give satisfactory results, which will check very closely with plant operation. A convenient amount of oil is 200 cc. in an 800 cc. beaker. When clay pulp is used, a 1000 cc. or 1500 cc. beaker is better. Add the clay to the cold oil and heat as rapidly as possible while keeping the clay and oil thoroughly mixed. A fairly high speed mechanical agitator will give much better results than hand stirring.

"A piece of light wire fastened to the agitator about 2½ inches below the top of the beaker will help keep the foam down and speed up the operation. Hold the oil at the maximum temperature until the foam caused by the moisture in the clay has practically disappeared. This will usually be for from five to 10 minutes. Filter out the clay as quickly as possible.

"When a temperature above 300 degrees F. is to be used, heat the oil and clay in the beaker as above to about 260 degrees F. and hold it there until most of the

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foam is off. Transfer the oil and clay to a 1½ litre, round-bottom short-neck flask. This flask should have a steam line and a thermometer extending to the bottom and a vapor vent.

"Shake the flask gently to keep the clay from settling and heat to the desired temperature as rapidly as possible. Turn in a little steam at about 280 degrees F. and steam down from the maximum temperature to 300 degrees F. Continue cooling without steam to 250 degrees F. and filter. This method differs considerably from plant operation but gives comparable results."

Table 1 shows the results of compara-

SUMMARY

CLAY USED—	OIL USED	EFFICIENCY
Fuller's Earth		1.00
Halloysite No. 1 Raw (as received, moisture 15.7%)	Parco Neutral	0.60
" " " " " " " " " "	Parco Acid L. Resid. No. 1	0.20
" " " " " " " " " "	Penn. Oil No. 2	0.67
" " " " " " " " " "	Calif. Oil No. 1	1.00
" " " " " " " " " "	Calif Oil No. 2	1.33
" Raw Pulp (Moisture 75.6%)	Parco Neutral Less than	0.50
" " " " " "	Parco Acid Long Resid. No. 1	0.65
" " " " " "	Penn. Oil No. 2 Less than	0.13
" " " " " "	Calif. Oil No. 1	0.42
" 5% Acid Treated Pulp	Parco acid long Resid. No. 1	1.66
" " " " " "	Parco acid long Resid. No.2 less than	0.53
" " " " " "	Parco Neutral	1.50
" " " " " "	Penn. Oil No. 2	0.95
" " " " " "	Calif. Oil No. 2	4.00
" " " " " " (Redried)	Parco acid L. Resid. No. 1	0.22
5% Acid, dry treated	Parco acid L. Resid. No. 1	0.27
50% Acid treated pulp	Parco Neutral	10.00
" " " "	Parco Acid L. Resid. No. 1	5.00
" " " "	Penn. Oil No. 1 6.00 to	7.00
" " " "	Penn Oil No. 2	5.70
" " " "	Calif. No. 1	9.40

TABLE I

Comparative Tests on No. 1 Sample Halloysite and 100-Mesh Fuller's Earth

Clay Used—	Oil Used		Am't of clay used No. gal. (dry)	Am't of clay used gms/200cc (as is)	Max. Temp.	Color NPA	Efficiency Georgia Fullers as 1.0
Fuller's Earth	Parco	Neutral	1.5	36.	500° F.	8.	1.0
Halloysite, Raw	"	"	2.5	60.	"	8—	0.60
" Raw Pulp	"	"	2.3	196.6	"	9. +	less than 0.50
Fuller's Earth	"	"	3.0	72.0	"	6.5	1.0
Halloysite, 5% Acid Treated Pulp	"	"	0.6	45.0	"	10. +	—
" 5% Acid Treated Pulp	"	"	2.0	150.	"	6.5	1.50
Fuller's Earth	"	"	1.8	43.2	"	8.0—	1.0
Halloysite, 50% Acid Treated Pulp	"	"	0.8	107.8	"	6.5	..
" 50% Acid Treated Pulp	"	"	0.4	53.9	"	7.5	—
" 50% Acid Treated Pulp	"	"	0.2	26.9	"	7.5	—
" 50% Acid Treated Pulp	"	"	0.18	20.2	"	8.0—	10.0
Fuller's Earth	Parco Acid L.R.	No. 1	0.4	9.6	"	8.0—	1.0
Halloysite, Raw	" " "	No. 1	1.5	36.0	"	8.0+	—
" Raw	" " "	No. 1	2.5	60.0	"	8.0	—
" Raw	" " "	No. 1	2.0	48.0	"	8.0—	0.2
Fuller's Earth	" " "	No. 1	1.5	36.0	"	7. —	1.0
Halloysite, Raw Pulp	" " "	No. 1	1.2	98.3	"	8. —	—
" Raw Pulp	" " "	No. 1	2.1	172.1	"	7.5+	—
" Raw Pulp	" " "	No. 1	2.3	196.6	"	7. —	.65
Fuller's Earth	" " "	No. 1	0.4	9.6	"	7.5+	1.0
Halloysite, 5% Dry Acid Treated Pulp	" " "	No. 1	3.0	72.	"	6. +	—
" 5% Dry Acid Treated Pulp	" " "	No. 1	1.5	36.	"	7.5+	0.27
Fuller's Earth	" " "	No. 1	1.5	36.	"	7. —	1.00
Halloysite, 5% Acid Treated Pulp	" " "	No. 1	1.6	160.7	"	6. +	—
" 5% Acid Treated Pulp	" " "	No. 1	1.1	107.1	"	6.5—	—
" 5% Acid Treated Pulp	" " "	No. 1	0.9	85.7	"	7. —	1.66
Fuller's Earth	" " "	No. 1	0.4	9.6	"	7.5+	1.00
Halloysite, 5% Acid Treated, dried	" " "	No. 1	1.2	28.8	"	9. +	—
" 5% Acid Treated, dried	" " "	No. 1	1.8	43.2	"	7.5+	0.22
Fuller's Earth	" " "	No. 1	1.5	36.	"	5.5	1.00
Halloysite, 50% Acid Treated	" " "	No. 1	0.4	53.9	"	5.4+	—
" 50% Acid Treated	" " "	No. 1	.25	33.7	"	6. +	—
" 50% Acid Treated	" " "	No. 1	.30	40.5	"	5.5	5.00
Fuller's Earth	" " "	No. 2	2.0	48.0	"	7.5	—
Halloysite, 5% Acid Treated Pulp	" " "	No. 2	1.5	109.8	"	8.5—	less than 0.53
Fuller's Earth	" " "	No. 2	1.5	36.0	"	8.0	—
Fuller's Earth	" " "	No. 2	1.0	24.0	"	8.0+	—
Fuller's Earth	" " "	No. 2	0.8	19.2	"	8.4+	1.0
Fuller's Earth	Penn. Oil	No. 1	0.5	12.0	"	4.75	1.0
Halloysite, 50% Acid Treated	" "	No. 1	0.4	53.9	"	3.50	—
" 50% Acid Treated	" "	No. 1	0.05	6.7	"	5. —	—
" 50% Acid Treated	" "	No. 1	0.1	13.5	"	4.75—	—
" 50% Acid Treated	" "	No. 1	0.07	9.4	"	4.75+	6.0 to 7.0
Fuller's Earth	" "	No. 2	0.4	9.6	"	5.3	1.0
Halloysite, Raw	" "	No. 2	2.0	48.0	"	4.5+	—
" Raw	" "	No. 2	1.4	33.6	"	4.6+	—
" Raw	" "	No. 2	0.8	19.2	"	5. +	—
" Raw	" "	No. 2	0.4	9.6	"	5.4	—
" Raw	" "	No. 2	0.6	14.4	"	5.3	0.67
" Raw Pulp	" "	No. 2	0.47	39.3	"	7. —	—
" Raw Pulp	" "	No. 2	0.94	78.6	"	6. —	—
" Raw Pulp	" "	No. 2	2.34	196.6	"	5.3+	less than 0.13
" 5% Acid Treated Pulp	" "	No. 2	0.84	64.0	"	4.5+	—
" 5% Acid Treated Pulp	" "	No. 2	0.42	32.0	"	5.3	0.95
" 50% Acid Treated Pulp	" "	No. 2	0.07	9.4	"	5.3	5.7
Fuller's Earth	California	No. 1	1.5	36.0	"	4. +	1.0
Halloysite, Raw	"	No. 1	0.8	19.2	"	4.5	—
" Raw	"	No. 1	1.5	36.0	"	4. +	1.0
Fuller's Earth	"	No. 1	1.0	24.0	350°F.	4.5+	1.0
Halloysite, Raw Pulp	"	No. 1	2.34	196.6	"	4.5+	0.42
Fuller's Earth	"	No. 1	1.5	36.0	"	4. +	1.0
Halloysite, 50% Acid Treated Pulp	"	No. 1	0.5	67.4	"	2.5	—
" 50% Acid Treated Pulp	"	No. 1	0.2	27.0	"	4.	—
" 50% Acid Treated Pulp	"	No. 1	.16	21.6	"	4. +	9.4
Fuller's Earth	"	No. 2	0.8	19.2	400° F.	4.25	1.0
Halloysite, Raw	"	No. 2	0.6	14.4	"	4.25	1.33
Fuller's Earth	"	No. 2	0.4	9.6	"	4.75	1.00
Halloysite, 5% Acid Treated Pulp	"	No. 2	0.4	76.4	"	3. +	—
" 5% Acid Treated Pulp	"	No. 2	0.2	38.2	"	3.1+	—
" 5% Acid Treated Pulp	"	No. 2	0.1	19.1	"	4.75	4.00
Fuller's Earth	"	No. 2	2.0	48.0	"	3.3	—
Fuller's Earth	"	No. 2	2.4	57.6	"	3.3	—

NOTE 1. Attention is called to the fact that the color obtained with 0.4 lb. 5% acid treated Halloysite was unattainable with Fuller's Earth.

NOTE 2. OILS USED IN TESTS.

Parco Neutral—Parco Green Cyl. Stock, Neutral, 133/210° Vis.
Parco Acid L. R. No. 1—Parco Acid Long Residuum from Craig Crude, 440 flash.
Parco Acid L. R. No. 2—Parco Acid Long Residuum from Lost Soldier, 530 flash.
Penn. No. 1—Power Lube Light,—Color 6—.
Penn. No. 2—Quaker State, Medium, 200 vis. at 100° F., Color 7+.
Cal'f. No. 1.—50-50 Blend Zerolene & Shell-Light, 200 vis. at 100° F., Color 4.5.
Calif. No. 2—Unared Engine Oil,—Color 3.5.

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tive filtrating tests between 100-mesh Georgia fullers earth and samples of halloysite, No. 1, both untreated and treated according to the methods previously described.

A summary of the results of these comparative filtration efficiencies between this No. 1 sample of halloysite (both raw and treated by various methods) and 100-mesh Georgia fullers earth is shown below:

From this summary the following facts are to be noted:

1. With the exception of the two California oils, where the efficiency as compared with fullers earth is 1.0 and 1.33, the finely-ground, untreated halloysite is less efficient than fullers earth and hence not economical for use.

2. The "raw pulp" was less efficient than the dry halloysite in all cases except on the "acid long residuum", where the efficiency of the clay as compared with fullers earth was increased from 0.20 to 0.65. In no instance, however, would the use of halloysite in "raw pulp" form be a feasible proposition.

3. In all cases the "5 per cent acid-treated pulp" was more efficient than the finely-ground, untreated halloysite when applied to the same oils. This was particularly noticeable on "California Oil No. 2," where the treated clay, applied to this particular oil, showed an increase in efficiency from 1.33 to 4.0

4. Both the "5 per cent dry acid treatment" and the "5 per cent acid treatment dried" showed no greatly appreciable increase in efficiency over the raw, ground halloysite, although, true enough, the comparison was made on only one oil, ("acid long residuum No. 1"). Here, the apparent increase in efficiency was from 0.20 to 0.27 and 0.22 respectively. The benefits might have been more apparent had California asphaltic base oils been used in this particular instance in making comparisons.

5. The "50 per cent acid treated pulp" was by far the most efficient of all the methods of treating, showing an efficiency of 10 times that of fullers earth on a neutral cylinder stock, 133/210 viscosity; 9.4 times the efficiency of fullers earth on a California asphaltic base neutral oil, 200/100 viscosity; an efficiency of from 5.7 on one sample to between 6.0 and 7.0 on another sample of Pennsylvania, paraffin base neutral oil; and an efficiency of 5 times that of fullers earth on a 440 degrees F. flash long residuum, acid stage. In the latter case, the clay was compelled both to decolorize and to deacidify the oil.

From the above it is obvious that the economical way to use this particular halloysite, on most oils, is to give the clay a 50 per cent acid theatment and thereafter apply same to the oil in the form of a clay pulp.

Halloysite sample 2 was ground and screened to 100-mesh fineness and was tested in the "raw", that is, "as received" condition (containing 13.5 per cent moisture) and also in the form of a "50 per cent acid treated pulp." The method of treating the clay was similar to that previously described for the treatment of halloysite sample No. 1, with the exception that less wash-water was used in washing out the excess acid and the products of the reaction: in this case, three-fourths gallon of water per pound of clay so treated, as compared with one gallon per pound in the first instance. With this sample 12.3 hours was the total settling time during the washing procedure. The recovery of clay (net dry) from the acid treatment was 78 per cent; while the treated clay-pulp contained 15.7 per cent of solids.

The relative filtration efficiencies of the raw clay and the acid-treated clay (compared with 100-mesh Georgia fullers, which is considered as having an efficiency of 1.0) were determined on the following oils:

1. Cylinder stock residuum, acid stage, 525 degrees F. flash.

2. Simpson Ridge (asphalt base) lubricating distillate, acid stage, 250/100 degrees F. viscosity.

3. Medium motor oil, neutral, 400 degrees F. flash, 300/100 degrees F. viscosity, 5.5 NPA color.

Table 2 shows the results of the filtration tests conducted with the raw and treated clays on the above-mentioned oils:

From this summary it is to be noted that:

1. This sample of finely-ground halloysite, untreated, is less efficient than 100-mesh fullers earth; although it did show an efficiency of 0.8 on a 300/100 degrees F. viscosity motor oil, neutral.

2. Treated with 50 per cent by weight of acid, washed, and applied to the oil in the form of a clay pulp, the treated sample of halloysite showed an efficiency of 5.7 times that of fullers earth on a 525 degrees F. flash cylinder stock, acid stage; 6 times that of fullers earth on a 250/100 degrees F. viscosity asphalt base lubricating distillate, acid stage; and 10 times that of fullers earth on a 300/100 degrees F. viscosity motor oil, neutral.

Because of the high increase in efficiency of Arizona halloysite upon acid treatment as indicated by the results shown in this article, knowing the quantities of the material that are available and because of the refiner's willingness to adopt the clay-pulp method of contact filtration, the writer belives that the time is not far distant when the Arizona product will be replacing the California montmorillonite now being used.

TABLE 2

COMPARATIVE FILTRATION TESTS ON UNTREATED AND TREATED HALLOYSITE SAMPLE NO. 2 AND 100-MESH FULLERS EARTH

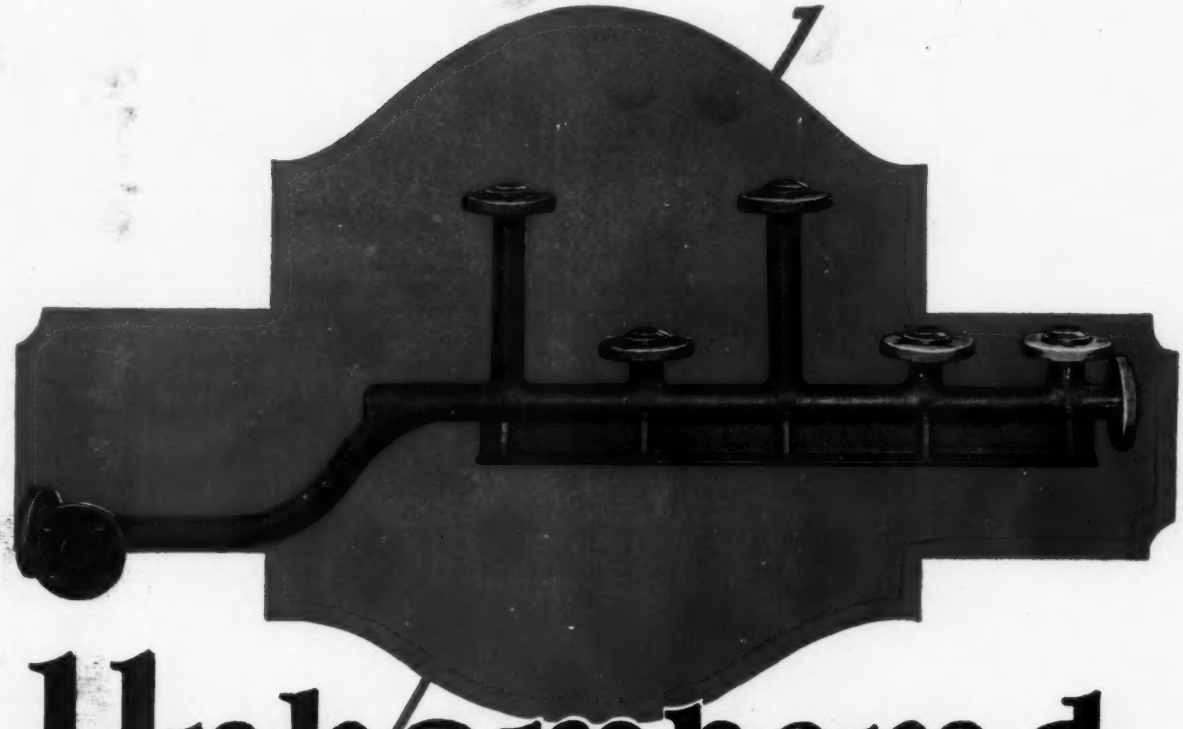
CLAY USED	OIL USED	Amount clay used No. gal. (dry clay)	gms/200cc (as is)	N.P.A. Color	Max. Temp.	Efficiency
Fuller's Earth	Cyl. Stock Resid. Acid stage	2.0	48.0	7. —	600° F.	
" "	" " " " "	1.2	28.8	8. —	"	
" "	" " " " "	0.8	19.2	8. —	"	1.0
Halloysite No. 2, raw	" " " " "	2.0	48.0	8. +	"	
" " "	" " " " "	3.0	72.0	8. +	"	less than 0.4
Fuller's Earth	" " " " "	2.0	48.0	7. —	"	1.0
Halloysite No. 2, 50% Acid Treated Pulp	" " " " "	1.0	153.2	5. —	"	
" " " " " "	" " " " "	0.5	76.6	6. —	"	
" " " " " "	" " " " "	0.3	46.0	6.5+	"	
" " " " " "	" " " " "	0.35	53.6	7. —	"	5.7
Fuller's Earth	Simpson Ridge L. Dist. Acid stage	0.5	12.0	4.5—	450°F.	1.0
Halloysite No. 2, raw,	" " " " "	0.5	12.0	5. +	"	
" " "	" " " " "	1.0	24.0	4.5+	"	
" " "	" " " " "	1.2	28.8	4.5—	"	0.4
Fuller's Earth	" " " " "	0.9	21.6	4.2	"	1.0
Halloysite No. 2, 50% Acid Treated Pulp	" " " " "	0.1	15.3	4.5	"	
" " " " " "	" " " " "	0.15	23.0	4.2	"	6.0
Fuller's Earth	Med. Motor Oil, Neutral	1.0	24.0	4.7	500°F.	1.0
Halloysite No. 2, raw,	" " " "	2.5	60.0	4. +	"	
" " "	" " " "	1.7	40.8	4.5—	"	
" " "	" " " "	1.4	33.6	4.6	"	
" " "	" " " "	1.2	28.8	4.8	"	
" " "	" " " "	1.3	31.2	4.7	"	0.8
Fuller's Earth	" " " "	2.5	60.0	4.4	"	1.0
Halloysite No. 2, 50% Acid Treated Pulp	" " " "	0.3	46.0	4.3	"	
" " " " " "	" " " "	0.1	15.3	6. —	"	
" " " " " "	" " " "	0.25	38.3	4.4	"	10.0

A summary of the filtration efficiencies obtained with Arizona halloysite, sample No. 2, is shown below:

SUMMARY OF FILTRATION EFFICIENCIES

CLAY—	OIL USED—	EFFICIENCY
Fuller's Earth	Cyl. Stock Residuum, acid stage	1.0
Halloysite No. 2, raw	" " " " "	less than 0.4
Halloysite No. 2, 50% Acid Treated Pulp	" " " " "	5.7
Fuller's Earth	Simpson Ridge Lub. Dist., Acid Stage	1.0
Halloysite No. 2, raw	" " " " " "	0.4
Halloysite No. 2, 50% Acid Treated Pulp	" " " " " "	6.0
Fuller's Earth	Medium Motor Oil Neutral	1.0
Halloysite, Raw	" " " "	0.8
Halloysite, 50% Acid Treated Pulp	" " " "	10.0

Chatham, Ontario.—The Regal Oil Refinery, Ltd., announces plans for the construction of a small refinery to be located in the industrial section of Calgary, Ontario. The company is financed by Montana and Calgary capital and is capitalized at $100,000. The original unit will have a capacity of 500 barrels daily, which is soon to be enlarged to 750 barrels. The plant is to operate on Montana crude.



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The Survival of the Fittest

By P. M. MISKELL
President Western Petroleum Refiners Association

IN this country we have long elected to base national, personal, and commercial existence on the theory that equal privileges and competitive independence are essential to real success as well as conditions that must prevail where the inalienable rights of all include such factors as life, liberty and the pursuit of happiness.

Observance of these rights, however, fulfills a two-fold purpose. It discourages the strong from preying on the weak, just as it discourages the weak from hampering the progress of the strong. As the only possible result under such a code is the production of a higher level of competence, it is not remarkable that our nation, our citizens, and our business enterprises now command greater respect than in the past; nor that "Survival of the Fittest" assumes a meaning far removed from the old idea that "Might Makes Right" and that progress is only possible through "War to the Knife, and the Knife to the Hilt."

What is best is not always obvious nor immediately attainable, hence, without change in the great basic principles under which they operate, the nation contracts new laws, persons entertain new thoughts, and business makes new discoveries.

"E Pluribus Unum" fairly reeks with the spirit of co-operation, yet it was but a few months ago that Judge Gary made this statement: "Everyone present will remember the days when the steelmasters of this country were engaged in industrial war; when the hand of the steelmaker was raised against his brother; when, practically, in the steel business, might made right; when the Golden Rule was subordinated to the supposed pecuniary, if temporary, success of might and strength; when jealousy, discord, and brutal antagonism prevailed, and all this to the ultimate loss of all who were engaged in the strife. Just as well do we remember when the unfortunate results of contest brought adversity and poverty. And with pleasure and satisfaction do we recall the awakening of our minds and hearts and souls, which exposed to our consciences the realization that acquaintances in our lines of business endeavor were in truth possessed of the same sensibilities as ourselves and were willing to try the experiment of treating our competitors as friends and compainions."

It was also not so very long ago that Kent Cooper, General Manager of the Associated Press, remarked that "America's increased demand for business news has been one of the outstanding facts of the post-war period."

Statements such as those we have quoted illustrate the tendency of modern business. A man's business is no longer regarded as "his own business." It has been found that the general welfare of all requires that each enterprise be conducted in such a manner that it contributes to the common cause, and that the judgment used in the proper control of individual actions must depend on actual knowledge of conditions. The life of any industry, therefore, is a continual race between catastrophe and education, and the continual cry is for additional facts to point the way.

The refining industry, like other lines of endeavor, has found that facts are the least developed of our natural resources. It was only in 1917 that monthly data regarding stocks and output were made available by the Bureau of Mines, while as far down as the summer of 1923, when the cry of the Mid-Continent refiner was "If we had only known," articles on economic principles, or analyses of the government reports, were novelties. One has only to run through the issues of the trade journals from year to year to realize that knowledge necessary to successful co-operation, or unity of action in response to the necessities of demand, is a comparatively recent acquisition that has been forced on the industry by recurring disaster and in the face of opposition from the industry itself.

Possibly this opposition was not unnatural. There has always been considerable nonsense about economics in the oil industry—not in economics, but about economics. When the theory that self preservation and observance of the rights of others was first recognized as a correct principle of business administration by the refining industry, knowledge of conditions became an imperative need. In consequence of such a situation units of the industry were besieged by the questionnaire, bombarded with figures, flooded with bulletins, and buried under an avalanche of articles dealing with the economics of their business. The refiner in search of facts was confronted with a multitude of fancies and loosely-constructed conclusions, amply illustrated by complicated charts and tables, while often the mass of data dealt in terms with which he was unfamiliar and apparently had but slight connection with the problems he wished to solve. It is not remarkable, therefore, that some should question the wisdom of such research, that we occasionally encounter those who claim to be 100 per cent anti-statistical, nor that others should assume the attitude of "what's the use" and either maintain, or revert, to the hit or miss policies that occasionally seemed adequate when competition was less intricate and when the supply of gasoline required a constant increase in the refining capacity of the country.

However, some few truths, and these the very essence of business economics, have successfully maintained themselves. We doubt if any refiner can conscientiously say that in his opinion there are no economic laws that effect his business, nor that the working of these laws is not observable from the facts at hand. For example, who, in the face of the many disastrous experiences of the past, would ever question that overproduction must take its tell from value? A sudden storm will cause telephone calls in New York City to jump 100,000 above normal in 60 minutes. The telephone company capitalizes this knowledge of cause and effect and secures economies in operation by the alteration of facilities to meet unusual requirements. The storm, not the flashing lights of the switchboard, is the signal that enables the executive to maintain service at its normal level. Likewise, in commercial enterprises, a reduction in profit is sufficient indication of some new development, just as overproduction instantly suggests a price decline.

Occasionally, refiners seem willing to ignore their past experiences and cast economic principles to the winds. They may still believe that prosperity rests with stability, that stability is only possible through voluntary co-operation and that voluntary cooperation should be based on knowledge of

THIS is reprinted from the bulletin of the Western Petroleum Refiners association. This announcement was carried along with the article in the bulletin:

"Articles dealing with problems of the refiner naturally receive greater consideration where there exists some personal acquaintance with the author. The Association therefore requests its members to present their ideas to their business associates through the medium of our bulletins. The article that follows, written by President Miskell, is the first in a series, one of which we trust will be available for publication during each succeeding month.

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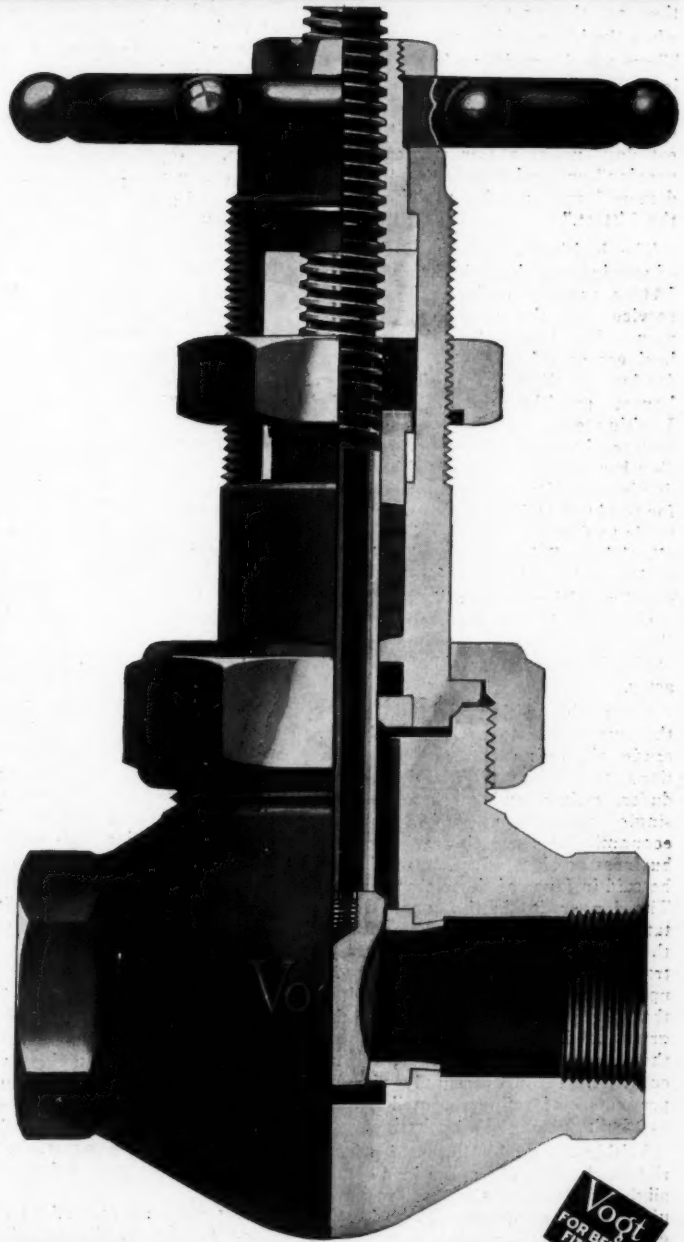

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conditions and directed by a mutual mental accord as to the correct procedure, however, their real operations are often conducted in channels they would publicly condemn.

Situations of this nature are manifest in the abandonment of caution just when extreme caution is most advisable. When there is an oversupply of crude or when refiners find competition on the ascendancy are periods when the industry is most apt to falter. These are the periods when crude runs increase, when supply exceeds demand, when suspicion and price recessions are the order of the day, and when "dog eat dog" under a thin veneer of "expansion" or "maintenance of the crude demand" masquerades as "Survival of the Fittest."

The legitimate growth of the units of any industry is limited only by such factors as opportunity, price, quality, service, and the enactments that bar monopoly. Fortunately this is so, for business would present a dreary field for human effort if real efficiency, and honest ambition, were unrewarded. Legitimate growth, however, is never a matter of mere desire, for when expansion has no more substantial basis, productive capacity soon outgrows demand for products and cut-throat competition tends to destroy the gains for each and all. The refining group wherein competing units fail to subordinate personal ambition to a collective adjustment of production to meet the size of the market that will consume its goods at the fairest net return but courts disaster.

Companies within the oil industry that may elect to produce and refine crude oil, refine and market distillations, or combine the functions of producer, refiner and marketer under a single management, infringe neither economic laws nor the ethics of good business conduct. In fact, much might be said in favor of those that integrate. The danger lies in the constant temptation presented for one component of the integration to seek volume in its transactions regardless of the ill-effect upon other branches of the industry that may be complemental to the integration. Thus it sometimes occurs that companies with crude production contribute to an oversupply of refined products, and refiners contribute to an overbuilt system of distribution.

Within reasonable limits of price variation the procedures outlined have but slight effect upon the total volume of ultimate consumption. They do, however, menace the maintenance of a fair and profitable margin between the cost of raw material to the refiner and the cost of refined products to the consumer, therefore, if it is granted that the producer, the refiner, and the marketer, perform a useful service, regardless of any temporary advantage that may accrue, such procedures must eventually prove self-destructive and should be classed as infringements on the rights of others.

With respect to those in the refining business, who, with disregard for costs, seek volume of business through the simple process of unwarranted price recessions, they also must be classed with those who ignore the basic principles of our national, personal and business code. The attainment of a momentary advantage that must eventually impair the profitable operation of their own business, even when the process forces hardship on competitors, in the end is but commercial suicide. Possibly they are blinded to their ultimate welfare by the nearness of the immediate reward, or again they may imagine that their available funds might well be spent in the destruction of competitors that eventually, through an artificial scarcity of products, they might recoup their losses at some future time. Such lines of reasoning, however, are fallacious. At best unwarranted price recessions afford but temporary advantage for news of prices quickly spreads to the entire industry, and the whole price structure continually tends to revert to the level established by these recessions and this destroys the opportunity for even temporary rewards in the form of gallonage. Eventually under such a process refinery survival would be but a matter of crude discovery by integrated companies, and who would know, under such a system, just when and upon whom the blow would fall—just which ones would survive and which would perish.

By all means let us have "Survival of the Fittest." Not of the brand that comes from ruthless warfare, but that made possible by careful procedure along the lines suggested by past experience and a constant study of the economic news that comes to hand—a survival really based on fitness and where elimination falls only to the lot of those who prove incompetent—a survival that leaves nothing to mere hazard but recognizes refining as a business entitled to its rights and compensations.

Let refiners co-operate in the proper spirit and make secure their own salvation. Not the co-operation that insists procedure must be suited to the selfish aims of individuals and that "everyone is out of step but Jim," but the co-operation that respects the rights of others and is willing to give and take that the industry within which they operate may enjoy its right to prosper.

Let refiners, as well as complementary factors of the petroleum group, prepare for that day—and such a day will come—when investors tire and turn from statements with their rows of figures, and, regardless of the red or black, demand of each an accounting of his contributions to stability and the general welfare.

In view of both past achievements and future necessities refining, as an industry, well justifies its independence. Therefore, let the industry assert its right, quoting the conclusion of Washington's Farewell Address, "to progress without interruption to that degree of strength and consistency which is necessary to give it, humanely speaking, the command of its own fortunes."

Oklahoma University Gets Refining Plant

Norman, Okla.—Through the generosity of firms manufacturing refinery equipment the School of Petroleum Engineering of the University of Oklahoma is to have a refinery of sufficient capacity to give results directly comparable with commercial large-scale operation. The plant will have a capacity of 100 to 300 barrels of crude oil per day and will be of the most modern design.

The distilling equipment will consist of a pipe still wherein the oil is heated continuously, and a fractionating column 90 feet in height wherein the primary products, such as gasoline, kerosene, gas oil, and lubricating oils, are separated. The plant will be located on the University camps southeast of the old Engineering building and crude oil will be transported to the plant from the railroad siding by means of a pipe line previously used for transporting fuel oil. It is expected to have the plant in operation by the late fall.

The object of the installation is to provide instruction for students of petroleum engineering in plant operation and to collect information concerning heat exchange, fractionation, evaporation, chemical refining processes, etc. One feature of the plant will be a complete set of instruments for recording temperatures, flows, pressures, etc. No products will be merchandised in any way which might compete with commercial refineries, the sole object, as mentioned above, being to instruct students and to collect engineering information for the refining industry. It is anticipated that the plant will be operated on an average of twice a month on twelve hour runs and special attention will be given the matter of collecting abundant data and of working up the date of the runs by means of graphs and curves.

The equipment has been secured through the efforts of F. W. Padgett, Professor of Refinery Engineering; H. C. George, Director of the School of Petroleum Engineering, and friends of the school in the refining industry.

R. B. Roopen has been appointed safety director of the Humble Oil & Refining Company operations at Baytown.

R. Alfred Moore, chief lubrication engineer for the Skelly Oil Company at Tulsa has resigned this position to accept a position with the Crystal Oil Refining Corporation, where he is assistant to vice-president F. W. Burford. Mr. Moore will make his home in Shreveport upon assuming his new duties.

4 out of 5 Refineries use BANROC HEAT INSULATION

1. Due to its manufacture, Banroc Insulation is adaptable to every refinery requirement.

2. In each of its many forms, Banroc Insulation is flexible. It can be formed to fit any flat, curved or irregular surface.

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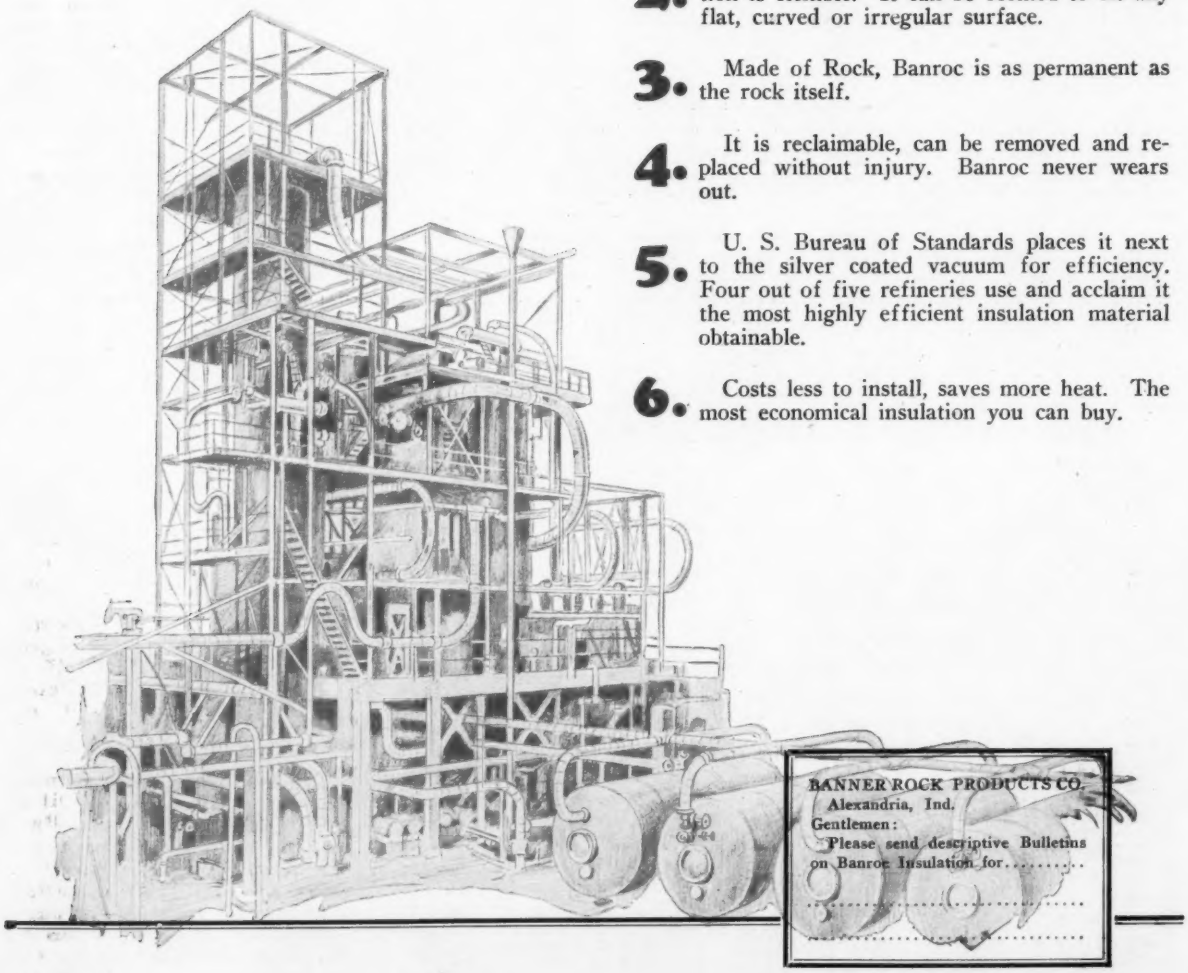
5. U. S. Bureau of Standards places it next to the silver coated vacuum for efficiency. Four out of five refineries use and acclaim it the most highly efficient insulation material obtainable.

6. Costs less to install, saves more heat. The most economical insulation you can buy.



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California Natural Gasoline Men Adopt By-Laws

Technical discussion followed by election of directors and naming of committees provided by corporate agreement

LOS ANGELES.—Probably the most important meeting since its inception was held here July 21 by the California Natural Gasoline Association. The meeting was considered a great success, both from the standpoint of attendance and of accomplishment.

A. K. Hegeman's paper on Isothermal and Adiabatic Compression, which appeared in the July issue of this magazine, resulted in an open forum discussion and constructive criticism, which was not confined to the particular type of engine dealt with in the paper, but included almost everything from slow speed Diesels to high compression products for automobile use. E. F. Jones presented a paper entitled "Slide Rule Computation of Gas Volumes from Orifice Meter Charts", pointing out that about twice as much per man hour of work could be accomplished by use of a specially prepared slide rule.

In addition to discussion on the two papers, election of 15 directors to fill out the total to 21 was accomplished. Those elected to serve two years in the directorate are R. E. Beckley, Standard Gasoline Company; J. S. Watson, Shell Company; H. W. Parmelee, California Gasoline Company; Lloyd Bayer, Associated Oil Company; A. H. Bradford, West Coast Refining Company; J. A. Campbell, Lomita Gasoline Company; J. N. Hicks, Superior Oil Company; H. R. Linhoff, Richfield Oil Company; H. E. Moulton, Chanslor-Canfield-Midway Oil Company; A. N. Porter, Shell Company; Carl J. Von Bibra, Export Refining Company. J. A. Campbell declined the election and nominated L. B. Cassidy, superintendent of the Lomita Gasoline Company, to fill the vacancy caused by his resignation. Final action has not been taken on the resignation of Mr. Campbell, who has been responsible for a great portion of the association's rapid growth and development.

Those who will serve a year in the directorate are H. L. Eggleston, Pan-American Petroleum Corporation; O. C. Field, O. C. Field Gasoline Corporation; R. W. Gorman, Union Oil Company; J. L. Denny, California Eastern Oil Company; Ben Kohler, George F. Getty, Inc.; S. B. Mosher, Signal Gasoline Company; E. R. Pratt, Honolulu Consolidated Oil Company; F. N. Rumbley, Lovell Gasoline Company; C. M. Scott, Belridge Oil Company; J. H. Vordermark, Torrance Gasoline and Refining Company.

Although only active members were allowed to vote, 92 ballots were cast. Total attendance at the meeting was about 200.

By-Laws Adopted

By-laws of the association, as submitted by the executive committee, were accepted by the membership without modification. There was, however, some argument on sections 2 and 3 of Article II, which in effect would bar manufacturers from voting power and active membership. It was pointed out by those contesting sections 2 and 3 that much of the research presented before the association was the result of work done in laboratories of the manufacturing concerns and that many of the active members, such as small operators, could not afford to maintain individual research laboratories. The question was asked, "If we rely upon the manufacturers' engineers to contribute much of the information that makes it possible for the association to be ranked as an educational, technical society, why should those making such contributions be denied the privilege of active membership?" By-laws of the association follow:

By-Laws

Preamble

Whereas, there are in the natural gasoline industry certain problems, more or less technical in nature, which are peculiar to the industry and the solution of which are of common interest to all interested therein; and,

Whereas, it is believed that by providing a common meeting ground where those interested may discuss these problems and co-operate in their solution to such an extent as may seem necessary or expedient, the best interests of the industry will be served and its advancement furthered, this Association is formed.

Article I

Name

The name of this association shall be California Natural Gasoline Association.

Article II

Membership

Section 1. Membership in this association shall consist of two classes—active and associate.

Section 2. Any person or persons, firm or corporation, engaged in the manufacture of natural gasoline, or any employee of such persons, firm or corporation, or any individual employed in a consulting capacity by any such person, firm or corporation, may become an active member.

Section 3. Any persons or persons, firm or corporation, engaged in the manufacture or sale of equipment and/or appliances for natural gasoline plants, or who is interested in natural gasoline other than in the actual manufacture thereof, may become an associate member. Associate members shall not be entitled to vote or hold elective offices but shall otherwise have the same rights and privileges as active members.

Section 4. Application shall be made in writing and shall certify over the applicant's signature the name of the person, firm or corporation that he represents or that he is employed by. Applications shall be made to the Secretary, accompanied by one year's dues in advance.

Section 5. Upon receipt of an application it shall be turned over to the Membership Committee, a majority of whom must personally satisfy themselves that the applicant is entiled to the class of membership applied for, which they will signify by their signatures on the application, and return same to the Secretary prior to the next meeting of the Executive Committee, at which time applicant will be voted on by acclamation.

Section 6. Active members severing their connection with the industry shall lose their rights to active membership but may be transferred to associate membership upon making application and paying the dues for that class of membership.

Article III

Officers and Board of Directors

Section 1. The officers of this association shall consist of a President, Vice-President, Secretary-Treasurer and Board of Directors.

Section 2. The Board of Directors shall consist of twenty-one (21) elected members, in addition to the President and Vice-President, making a total of twenty-three (23) members.

Section 3. The Board of Directors shall appoint an Executive Committee consisting of seven (7) members, in addition to the President and Vice-President, making a total of nine (9) members.

Article IV

Duties of Officers and Directors

Section 1. It shall be the duty of the President to preside at all meetings of this Association; call special meetings when necessary; appoint all committees created by these by-laws or by vote of the Association, subject to the confirmation of the Executive Committee; have general supervision over all matters appertaining to the Association, and perform such other duties as may be required of him by the the by-laws of this Association.

Section 2. It shall be the duty of the Vice-President to assist the President in the performance of his duties, as above stated, and to officiate for him in his absence.

Section 3. It shall be the duty of the Secretary-Treasurer to keep correst minutes of all sessions of the Association and of the Board of Directors and Executive Committee; to keep correct accounts between the Association and its members,

The whole refinery under your eye

COMPETITION has made continuous, exact knowledge and control of tower and still temperatures vitally essential to profits.

Brown indicating, recording and controlling pyrometers, mounted on a central board, assure control accuracy and dependability, plus maximum operating convenience. With such a control board before you, the whole refinery is under your eye. Brown Automatic Temperature Control being electrical, there is practically no distance limit between the meters and control valves.

For every plant layout, every system of operation, every refining objective involving process temperatures, there is a specification of Brown Pyrometers that meets every requirement of accuracy, sensitivity and dependability in temperature indicating, recording and control.

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and to receive all monies due the Association from any source whatever. He shall attend to all correspondence, subject to the approval of the President and the Executive Committee. He shall inform all persons elected to membership of that fact; notify members of all committees of their appointment, together with the subject given in their charge; shall send written notices to all members in arrears for dues, and shall send out notices of meetings of the Association, giving each member at least five days' notice thereof. He shall pay all bills against the Association, as approved by the President and Executive Committee, keeping a correct account of the amounts and sources of receipts and the amounts and purposes of all disbursements. He shall, at such time as the President and Executive Committee may direct, present for examination all books, papers, records and vouchers that may be necessary to a proper auditing of his accounts. He shall present at each regular meeting of the Executive Committee an itemized statement of the financial standing of the Association, together with a report of receipts and disbursements since the previous meeting. He shall give bond, if so required by the Executive Committee, in such sum as it may fix—the premium on such bond to be paid by the Association.

Section 4. The Board of Directors shall have control and supervision over the affairs and policy of the Association and shall be vested with title to all property of the Association. Acts of the Executive Committee shall be subject to the approval of the Board of Directors, and any member of the Executive Committee may be removed or replaced at any time by the majority vote of the Board.

Section 5. The Executive Committee shall have all the powers and duties vested in the Board of Directors and is created for the purpose of expediting and facilitating the work of that Board. It shall supervise and control the collection and disbursement of funds and property belonging to the Association and shall be authorized to incur such expenses as may be necessary in the proper conduct thereof. It shall also fix the salary to be paid to the Secretary-Treasurer, if any such salary be paid, and the salary of such other employees as may be required from time to time in the proper conduct of the affairs of the Association. No articles may be published at any time by the Association or any of its members, as originating within the Association, unless approved by the Executive Committee.

Article V

Election of Officers and Directors

Section 1. The President and Vice-President of this Association shall be elected from the Active members of the Association at the regular Annual Meeting of the Association and shall hold their offices for one year or until the next Annual Meeting, and/or until their successors are duly elected and qualified.

Section 2. The Secretary-Treasurer shall be appointed by the Executive Committee at their first regular meeting following the Annual Meeting. The Secretary does not have to be a member of the Association.

Section 3. The Board of Directors shall be elected from the Active members of the Association and shall serve for one year or until the next Annual Meeting, and/or until their successors are duly elected and qualified, provided, however, that upon the adoption of these by-laws eight (8) members shall be elected to serve for two (2) years each and seven (7) members shall be elected to serve for one (1) year each, and thereafter at each Annual Meeting held in an even year ten (10) members shall be elected to serve for two (2) years and each Annual Meeting held in an odd year eleven (11) members shall be elected to serve for two (2) years.

Section 4. At their first meeting following their election, the Board of Directors shall appoint, from among their own members, from nominations made by the President, seven (7) members of an Executive Committee to serve for one (1) year, and/or until their successors are duly appointed and qualified, provided, however, that the Executive Committee heretofore elected shall serve until the expiration of the terms for which they were previously elected.

Section 5. Elections shall be by written ballot and the candidate or candidates receiving the highest votes shall be declared elected. The Secretary shall notify all members of the fact that an election is to be held when sending out notices of such meetings.

Section 6. Prior to each Annual Meeting the President shall appoint a Nomi-

(Continued on page 114)

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The Metallic Lead Seal
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Pipe Joint Compound
Threads and joints won't leak after this metallic compound is applied. Especially desirable on hot lines. Heat makes the seal even more positive. Insoluble in oils, gasoline and acid. It's different. Request a sample.
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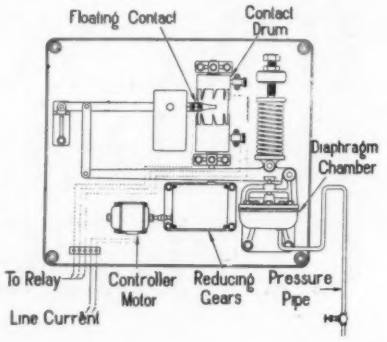
NEW EQUIPMENT, CATALOGS, BULLETINS, BOOKS

Reducing Valve Control

SCHUTTE & KOERTING CO.

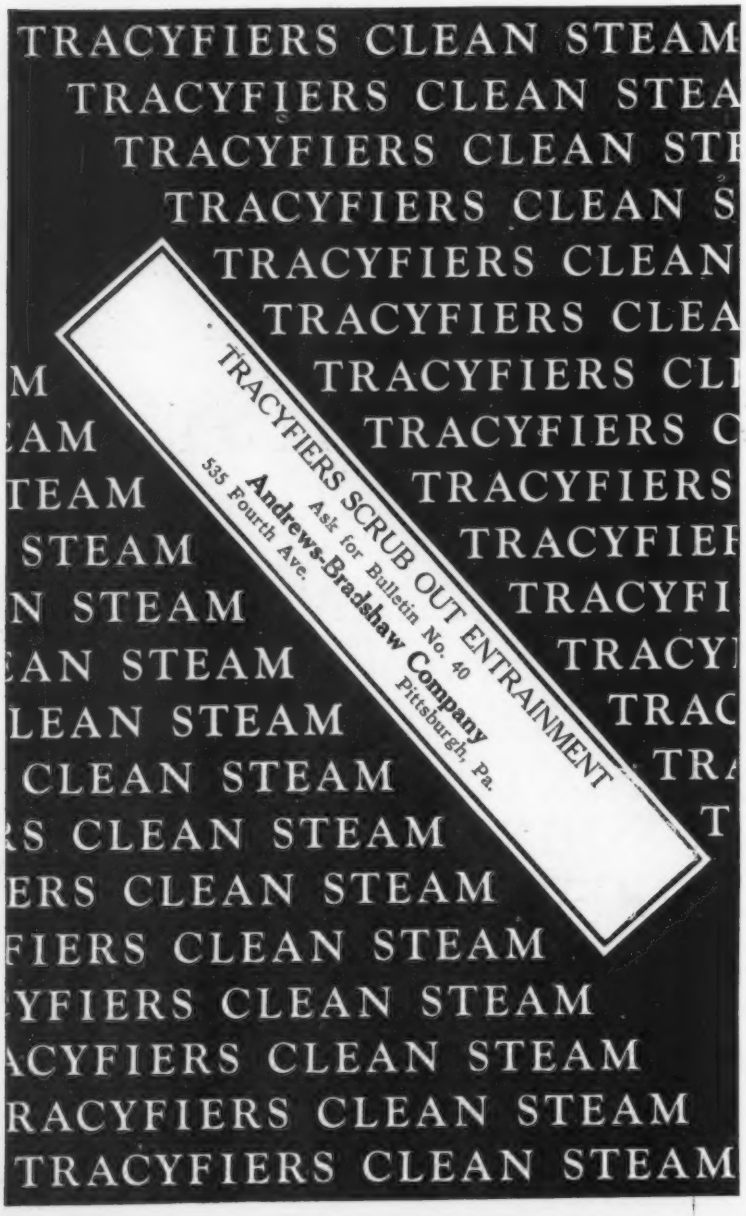
Schutte & Koerting Company, Philadelphia, announce a reducing valve control for use in instances where it becomes necessary to locate the main valve some distance from the point at which the reduced presure is to be controlled. This control is called the Helpbringer.

The control consists essentially of a pair of insulated contact drums mounted on a vertical shaft and driven through reducing gears by a small electric motor operating continuously. The motor runs at high speed but the drums turn very slowly—usually two revolutions per minute. The drums are separated by a gap the width of which can be adjusted. A small pressure pipe connects the low pressure steam main to the controller diaphragm chamber and variations in pressure in the main are transmitted to the diaphragm. A compound beam riding on the diaphragm and pivoted on knife edges carries a sliding weight that permits adjustment of the operating pressure. Excess pressure on the diaphragm is balanced by a heavy coil spring suitably mounted above the diaphragm chamber. The lower member of the compound lever carries an insulated finger that makes contact with either of the revolving drums. Each drum is fitted with a stationary brush contact connected through relays to the main valve motor, and when the floating lever makes contact with either drum, the electric circuit controlling the valve motor is closed and the motor operates to open or close the valve. This action increases or reduces the flow of high pressure steam until the predetermined reduced pressure has been re-established.



When the reduced pressure is steady and at proper value, the floating lever is in a horizontal position and the contact finger does not touch either drum; consequently the main valve motor circuit is open and the motor is not in operation. Should the pressure rise the diaphragm moves the compound lever upwards and the contact finger rides over the points on the upper drum. This produces a make and break action and an intermittent application of current to the motor operating the main valve. The period of contact varies with the change in pressure, the maximum amount of contact being obtained when the finger reaches a point where the contact surface on the drum is a continuous circle. When the lever is in the upper position the main valve motor operates to close the valve, reducing the flow of high pressure steam and, if necessary, shutting it off entirely.

When the pressure in the low pressure side of the system drops, the floating beam moves down, makes contact with the lower drum, closes the electric circuit which operates the main valve moto rin the opposite direction



The creation of the Federal Reserve Bank, with its standardization of the rediscount rate, has practically done away with financial panics resulting from "business cycles" which for many years were looked upon as an inevitable, recurring evil

The creation within the oil industry, and under its direction, of a Control Board of Petroleum Production will similarly stabilize and benefit the oil industry

By farsighted and fair-sided regulation, spasms of over-production can be largely avoided, fair prices automatically stabilized and fair profits assured those who efficiently manage their business

Universal Oil Products Company
Owner of the Dubbs Process
310 South Michigan Ave
Chicago, Illinois

and opens up this valve, increasing the flow of high pressure steam until the reduced pressure has been brought up to normal. Normally, the control mechanism operates the main valve motor in an intermittent manner, as described in the preceding paragraph, but should the reduced pressures become extremely high or low, continuous contact is made and the valve motor operates until the pressure approaches the desired value.

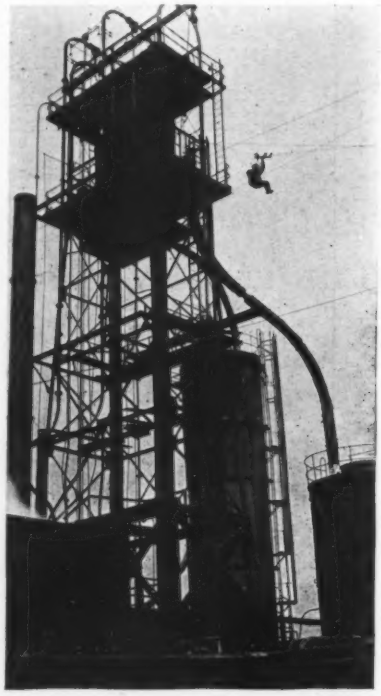
More details will be supplied on request.

The accompanying photograph illustrates a factor of safety that has been provided for the employes of the Shreveport Producing & Refining Company in their Shreveport refinery.

The picture shows a man leaving the top of the dephlegmator tower on a guy-wire aerial tram-way. As this man rides to safety on this improvised tram-way, an empty seat is returned to the top of the tower along the guy-wire, in order that additional men who might be up in the tower could ride to safety.

In many instances in the past refinery employes working in the top of the tower have been trapped by flames breaking out in the lower section of the tower and cutting off their means of escape.

It is possible for three men to make a safe descent from the top of the tower to the point of safety 100 feet away in two minutes.



Tracy Company Moved To Pittsburgh

Pittsburgh. — The Andrews-Bradshaw Company with headquarters in this city, has recently acquired full ownership of the Tracy Engineering Company, San Francisco, and the factory where Tracyfiers are made is now in Pittsburgh.

It is said that the change in factory location has made it possible to introduce new methods of manufacturing, and higher standards of accuracy.

Basic principles of the old Tracyfier have been retained, but the improved faciities have resulted in new features in the Pittsburgh made Tracyfiers.

A large floor area has been set aside and considerable equipment in the way of large motor-driven fans and boiler drums has been secured for making elaborate tests of Tracyfiers under any and all operating conditions.

Research work is under way at the present time relating to the use of the Tracyfier principle for the cleaning of gases other than steam. A good deal of work has been done in cleaning natural gas and in the separation of various liquids from their vapors, principally in oil refineries.

Hills-McCanna Company, 2025 Elston Avenue, Chicago, describes its force feed lubricators in a new bulletin which is just released. Copies can be had from the company.

A "Signal" Success

Here's How It Works on Gas Compressors

The following is from a prominent oil field engineer:

"When we started the plant to operating last October, the packing with which the engines were equipped, was removed by your Mr. Colligan and replaced with 'John Crane' Metallic Packing. Since that time the engines have been running almost continuously, and we have never had any trouble with the packing whatsoever.

"It is our opinion that we are working under rather adverse conditions as the corrosive hydrogen sulphide gas in this field is very hard on packing. However, we have been having wonderful success during the seven months we have been operating.

"Believe that 'John Crane' Packing is the best packing for use in Clark or Bessemer Gas Engines, and we are very well pleased with the service which we have obtained from it."

"John Crane" Craneum Style 250 is giving similar results on Worthington, Wilson-Snyder, National Transit, Union Steam Pump, Hot oil plunger pumps and Chicago Pneumatic, Bessemer, Clark, Ingersoll-Rand, Gas Lift Compressors.

Spirals or sets can be furnished. Order from jobber or direct.

CRANE PACKING CO., 1808 Cuyler Ave., Chicago, Ill.

"John Crane" Metallic Packing

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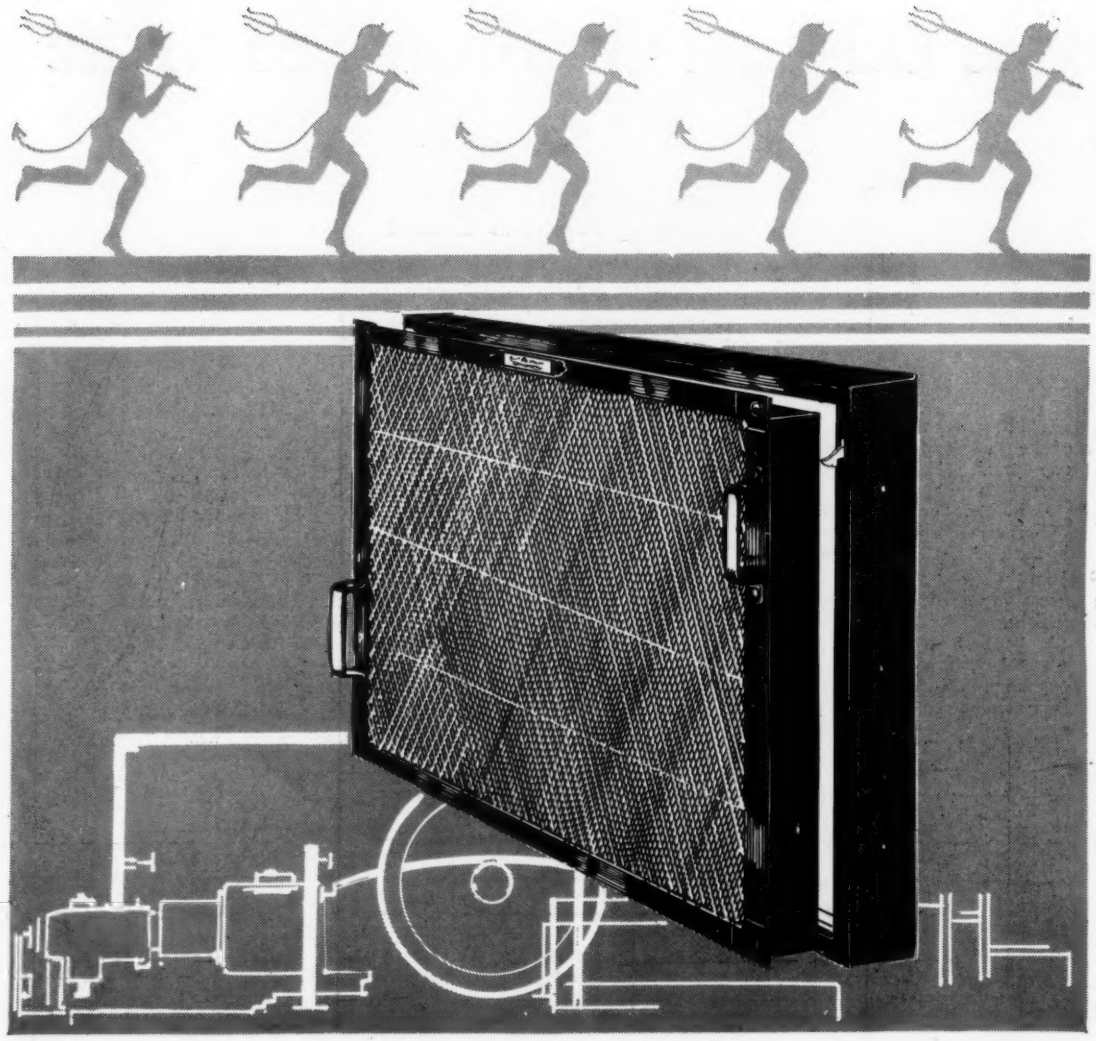

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Reed Filtered Air is Clean Air . . . free from the dust, grit and dirt that causes frequent shutdowns for costly repair jobs. Reed Air Filters are just as necessary on your engines and compressors as a good lubricator. Our free bulletin will prove interesting reading.

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Mention Where You Saw the Advertisement

Gas Oil-Fuel Oil Blends to Make Road Oil

By H. L. KAUFFMAN
Consulting Petroleum Chemist

WITH the exception of a few particular crudes, from an economic standpoint it is advantageous for most refiners manufacturing and selling "road oil" to make such products by blending together gas oil and fuel oil. The gas oil used in such cases either may be a "cut" obtained from the primary distillation of the crude or from the distillation of any unfinished distillates; or it may represent the "bottoms" obtained from the re-running of pressure distillate. The fuel oil is usually the residuum remaining in the still when distilling an asphaltic or mixed base crude oil.

The percentage proportion in which gas oil and fuel oil are blended together to make road oils naturally depends upon two factors: (1) the nature of the physical tests on the two individual constituents of the finished road oil; and (2) the particular grade of road oil (and specifications on such grade) that it is desired to make.

Since, for the most part, road oils are classified according to the percentage of asphalt of "100 penetration" contained therein, it necessarily follows that the percent of asphalt contained in the original fuel oil used in the blend has much to do with the percentage proportion in which the gas oil and fuel oil are blended together to make the finished product.

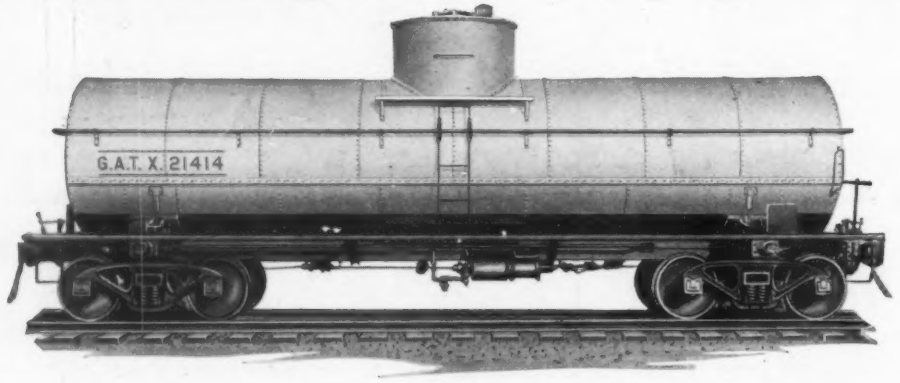
Laboratory Results

This article will summarize the results of some laboratory experimental blends made with heavy residuum obtained from Simpson Ridge (Wyoming) crude oil and gas oil "bottoms" resulting from the re-running of pressure distillate obtained from the Dubbs' cracking stills. From a study of this summary it is trusted that the reader who is in contact with the actual blending of road oils in refinery practice will find data that may be of interest and of assistance to him should the distillates and stocks in his particular refinery approach the physical characteristics of those used in making the experimental blends that will be discussed. While to the reader to whom the subject is new, it is hoped that the data will be at least partially instructive as to the manner in which road oils are made.

Simpson Ridge crude oil is obtained (several hundred barrels of it per day) in Carbon County, Wyoming, in the field of that same name. The crude is about 23 degrees A. P. I. gravity, is purely asphaltic in its characteristics, and contains valuable asphaltic lubricating oil fractions. It is this latter fact that causes this crude to be classified as "freakish", as compared with other Wyoming crude oils—all of which contain a sufficient quantity of waxy hydrocarbons so as to cause them to be classified as "mixed base."

The residuum or fuel oil used in making these experimental blends was "bottoms" from Simpson Ridge crude oil after a maximum quantity of the lubricating oil fraction had been distilled off overhead by a combined fire and steam distillation. This heavy fuel oil showed

EFFICIENT DEPENDABLE SERVICE



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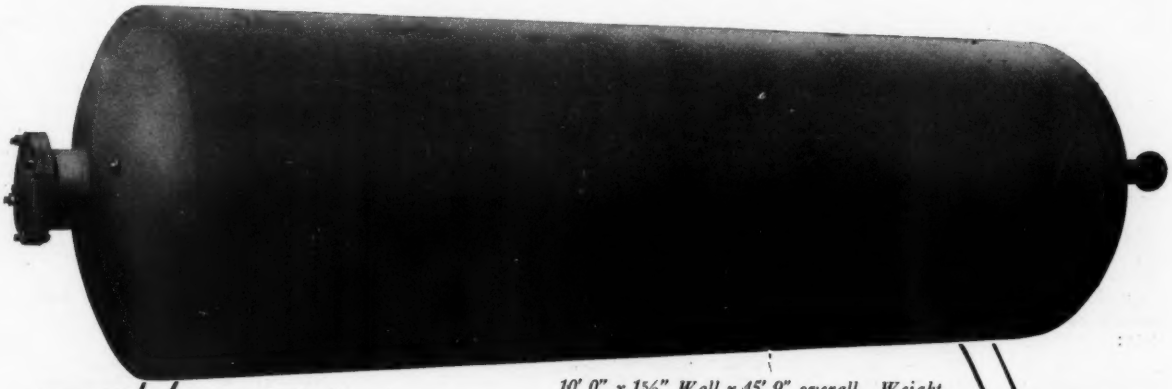

10' 0" x 1⅝" Wall x 45' 9" overall. Weight, 105,000 pounds. Tested to 400 pounds hydrostatic pressure.

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"NATIONAL" Hammer-welded Expansion Chambers, like other hammer-welded vessels for oil refining purposes, can be made to practically any design or specification, in diameters up to 10 feet and in wall-thicknesses up to 1⅝ inches.

Manways and nozzles are hammer-welded to the vessel at the mill; lugs and tapped holes can be furnished as desired—so that the vessel may be installed with little or no shop work at the point of erection.

"NATIONAL" Expansion Chambers are manufactured from high grade Open Hearth steel (made to special specifications), of high tensile strength and ductility, and the whole vessel is annealed at one time in the furnace to eliminate any stresses after manufacture.

With hammer-welded construction, there are no seams or rivet holes to leak, due to expansion and contraction strains from alternate heating and cooling down of the chambers, while the smooth interior surface offers the additional advantage of making it easy to clean out carbon deposits, etc.

Our Hammer-weld Fabricating Department is prepared to manufacture these vessels to wide range of specifications. Cooperation and complete information will be gladly given to those interested. Ask for "NATIONAL" Bulletin No. 13, describing high pressure vessels and stills for general purposes.

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the following physical characteristics upon laboratory analysis:

Gravity, ° A. P. I.	13.6
Flash, °F.	565
Fire °F.	655
Saybolt Universal Viscosity at 210 °F.	1002
Per cent of Asphalt of "100 Penetration"	96.8

As has been mentioned previously, the gas oil used in these blends represented the "bottoms" resulting from the re-running of Dubbs' pressure distillate. This gas oil showed the following physical tests:

Gravity, ° A. P. I.	31.9
Flash, ° F.	205
Fire, ° F.	225
Saybolt Universal Viscosity at 100° F.	Not taken

In making these laboratory tests, seven different experimental blends were made —in each of which the percentage of gas oil was increased and that of the fuel oil decreased by 12.5 per cent. The purpose of the tests was to ascertain, particularly, the flash, fire, viscosity and asphalt content of the products obtained by blending together in various proportions gas oil and fuel oil having the physical tests mentioned. It was especially desired to know what the asphalt content of each resultant blend would be, since the grades of road oil in most frequent demand are those containing 60 or 70 per cent of asphalt of 100 penetration—this percentage being ascertained by a method of testing that conforms to A. S. T. M. Standards.

Saybolt Universal viscosity determinations at 210 degrees F. were made on the blends in which 87.5 and 75.0 per cent of Simpson Ridge bottoms (fuel oil) were present. In the five other blends in the series, Saybolt Universal viscosities at 100 degrees were obtained.

The per cent of asphalt of 100-penetration was determined on the original fuel oil and on those blends in which 87.5 and 75.0 per cent of fuel oil were present. Because these results checked so closely with a "calculated" determination of the asphalt content of each blend, all percentages as to the asphalt content of the other blends (shown in the table immediately following) represent a *calculated* determination.

Table I shows in tabulated form the results of these laboratory experimental blends.

From this table it is to be noted that, as would be expected, if curves representing the gravity and asphalt content of each blend were plotted, such curves would approach a straight line; while, on the other hand, this would *not* be true of curves representing the flash and fire and viscosity figures obtained on each blend.

Table 1

Results of tests on road oil blends made up of 31.9 Gravity Gas Oil and 13.6 Gravity Still Bottoms from Simpson Ridge Crude Oil.

(Per Cent. by Volume) Composition of Blends	Gravity	Flash	Fire	Saybolt Viscosity 100°F.	Saybolt Viscosity 210°F	at 100 Per Cent. Penet'n Asphalt
100 % Simpson Ridge Bottoms 0 % Gas Oil	13.6°	565	655	....	1002	96.8
70.0% " " " 12.5% " "	15.6	255	350	....	276	84.7
75.0% " " " 25.0% " "	17.8	235	260	1778	115	72.6
62.5% " " " 37.5% " "	19.9	225	250	545	....	60.5
50.0% " " " 25.0% " "	22.3	215	250	183	....	48.4
37.5% " " " 62.5% " "	24.5	210	235	87	....	36.3
25.0% " " " 75.0% " "	27.0	210	230	54	....	24.2
12.5% " " " 87.5% " "	29.2	210	230	42	....	12.1
0 % " " " 100 % " "	31.9	205	225	....	....	0

Furthermore, for blends of gas oil and fuel oil possessing the physical tests indicated, those blends in which were present fuel oil and gas oil in the ratios of 75-25 and 62.5 to 37.5 are the ones that—*from the standpoint of suitability as to asphalt content*—might be considered as being most satisfactory as road oils; for the former shows an asphalt content of 72.6 per cent and the latter, 60.5 per cent.

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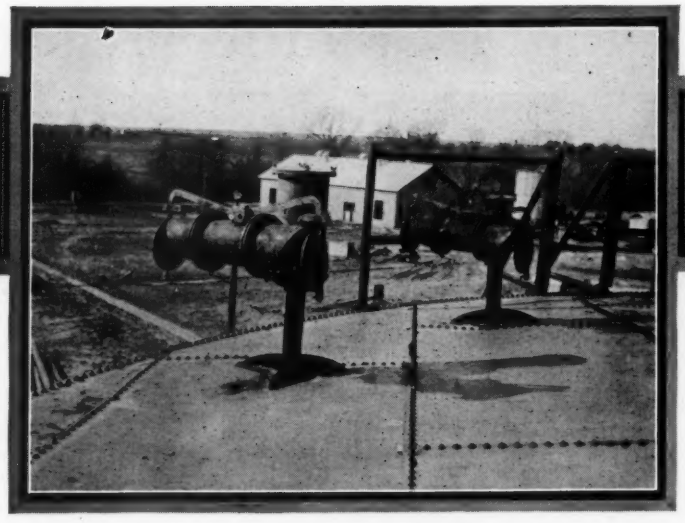

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Tank equipment for every purpose is made and sold by Westcott & Greis, whose tank experts are available for consultation at any time, without obligation. Ask to see one when you need equipment.

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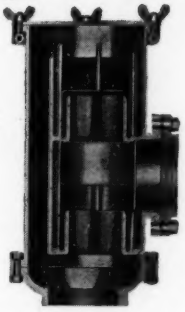
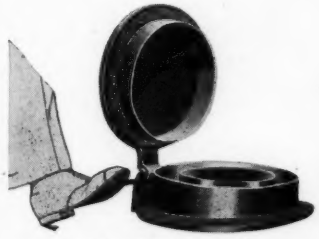


Liquid Safety Valve



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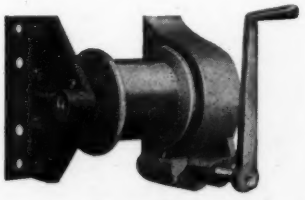

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Design of a Tool and Change House

By H. L. MINISTER

IN general the construction and layout of refinery buildings have been brought to a high point of perfection. Fire hazards, efficiency, general architectural lines and sanitation being the chief factors governing same.

In their effect on general plant design, refinery structures are divided into five main classes:

(a) Buildings relating to basic processes, operation.

(b) Buildings relating to shipping, compounding.

(c) Buildings relating to change houses, etc., within the plant.

(d) Buildings of administration.

(e) Buildings relating to housing of employes.

Buildings under classes a, b and d, need no discussion at this time. And while there is some criticism concerning classes c and d, all managements are bending every effort and using every resource available to the welfare of their employes.

The design of a tool and change room is of the utmost importance in that it directly concerns the welfare of workmen and efficiency of operations.

This building must be consistent, as regards fire hazard, architectural lines and sanitation; and at the same time properly located. Quite often one section under the condenser boxes, of stills is partitioned off and used for a change room. This makes a cheap, efficient and yet comfortable change room, and saves expensive buildings and space which can be used for operating buildings.

The writer found it necessary to design a tool and change room where no condenser box space was available, and where the fire hazard was greatest.

A tool and change room 16 feet by 56 feet by 10 feet was built of 4-inch by 12-inch by 12-inch hollow tile, coated with cement on both sides. The pilasters being of reinforced concrete; the roof of concrete and the foundations and floor, likewise of concrete.

The windows were steel sash, fitted with wire ribbed glass; while the doors were tin clad steel sash and wire ribbed glass.

This type of construction being used with excellent results and is one of great simplicity, as well as of economy.

The building is divided into four sections: (1) A section 16 feet by 16 feet, for shift men; (2) a section 8 feet by 16 feet for a wash room; (3) a section 8 feet by 16 feet for still cleaners; and (4) a section 16 feet by 24 feet, to be used for a tool room.

The shift men being separated from the still cleaners, due to the fact that there were only a few still cleaners and they are in more dirt and oil. Both sections are equipped with 12-inch by 15-inch by 3 feet 2-inch two-compartment all steel lockers.

The wash room contains a battery of six enameled iron lavatories, three showers and an automatic water closet. The tool room is properly equipped with the best design of racks, etc., to meet the requirements.

Quantity to be ordered. Material.

- 12 H.M No. 7501 unilet condulet fittings.
- 10 GNX No. 7534 unilet condulet fittings.
- 4 GNL No. 7505 unilet condulet fittings.
- 12 FSS No. 6629 unilet condulet fittings.
- 24 No. 7736 receptacles.
- 24 Benjamin type S supporting ring No. 4232 for above receptacles.
- 6 Benco sockets with Edison base.
- 24 Shallow bowl shade holder reflectors with Benjamin type S holders for Benjamin screw thread socket and fixtures, catalogue No. 11075-S.
- 500 feet ½-inch black conduit.
- 500 feet ¾-inch black conduit.
- 1 Benjamin type cabinet O. C. K. open front panel with cabinet, 3 wire main branches to have 30 amp. knife switches and arranged for cottage fuses. Directory frame on door and card holders for each circuit. Ben. cat. No. 23—No. 77835. 6-circuit.
- 2 1½-inch type F. E. B. fittings.
- 2 2-inch type F. E. B. fittings.
- 2 1¼-inch 3-hole porcelain covers for F. E. B. fittings.

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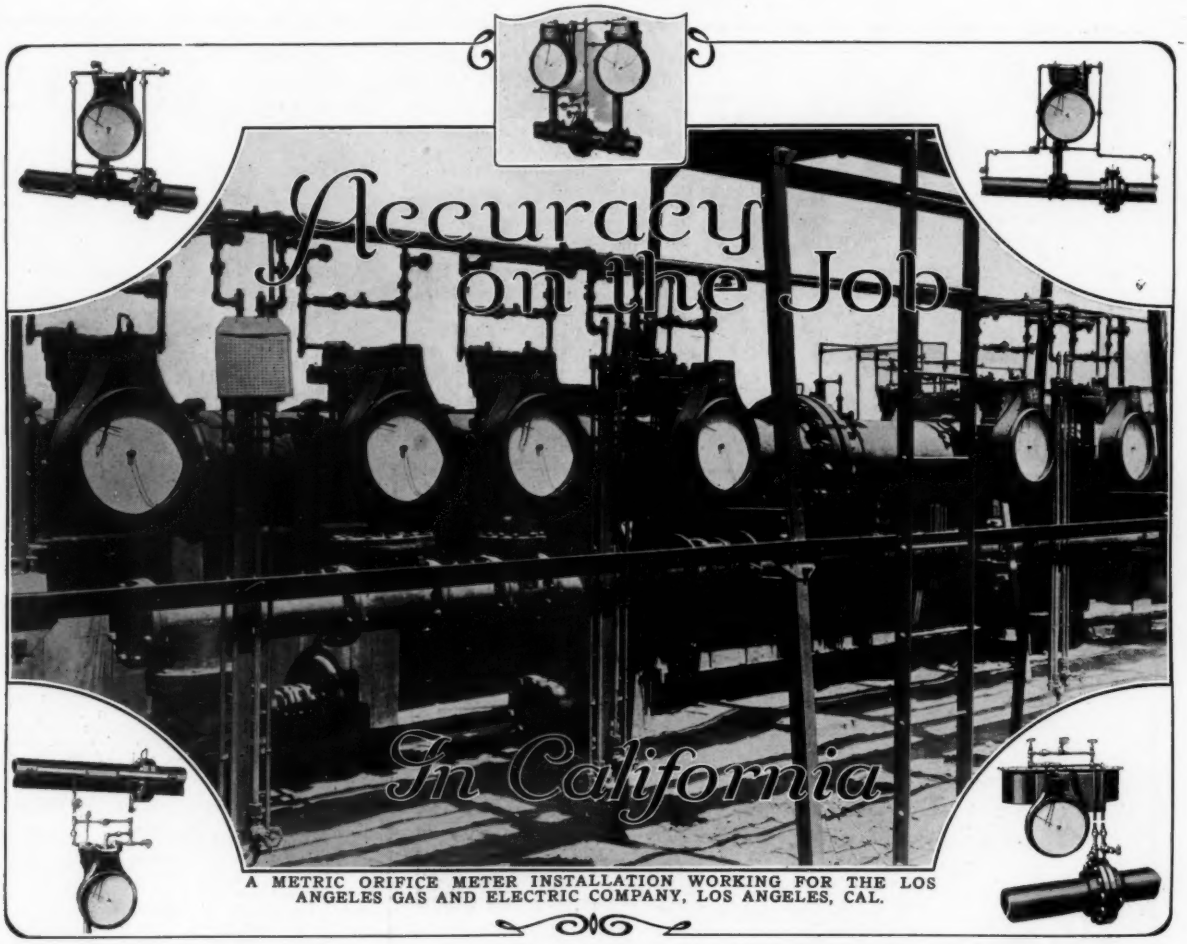

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3 ¾-inch 2-hole covers for F. E. B. fittings.
6 No. 50100 blank metal covers.
6 No. 50101 blank metal covers.
4 No. 721 Bryant receptacles on J. S. base.
6 No. 14051 covers for type FSS No. 6629 for two flush switches.
12 Single pole flush switches.
500 feet No. 10 RC new code wire.
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(Central Electric Supply Co., Denver, Colo., Cat. No. 9 ref.)
500 sacks cement.
40 C.Y. washed sand.
54 C.Y. screened gravel.
1800 lin. ft. ¾-inch square twisted steel bar.
2800 lin. ft. ⅜-inch square twisted steel bar.
5 pcs. 8-inch I-beam, 18-lb., 18 ft long.
11 pcs. 33-1-6-1 Truscon steel sash (12-inch by 18-inch glass.)
4 pcs. 2 ft. 8 inches by 6 ft. 8 inches tin clad doors—with 3-2 Truscon steel sash (12-inch by 18-inch glass in same.)
2 pcs. 2-ft 8-inch by 6 ft. 8-inch tin clad doors.
60 pcs. 12-inch by 18-inch wire ribbed glass.
22 pcs. 12-inch by 17⅛-inch wire ribbed glass.
44 pcs. 11-inch by 17⅛-inch wire ribbed glass.
1020 pcs. Truscon spring steel glazing clip.
5 lbs. putty.
11 pcs. Truscon angle brackets.
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200 lin. ft. 4-inch tile.
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3500 B.M. 1-inch sheathing.
68 pcs. 2-inch by 4-inch 16 ft. long—SISIE.
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12 pcs. FSS No. 6629 unilet condulet fittings.
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500 ft. ½-inch black conduit.
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1 pc. Benjamin type cabinet O. C. K. open front panel with cabinet. 3-wire main branches to have 30-amp. knife switches and arranged for cottage fuses. Directory frame and door and card holders for each circuit. Ben. Cat. No. 23-No. 77835 6- circuit.
2 pcs. 1½-inch type F.E.B. fittings.
2 pcs. 2-inch type F.E.B. fittings.
2 pcs. 1½-inch 3-hole porcelain covers for F.E.B. fittings.
2 pcs. 2-inch 3-hole porcelain covers for F.E.B. fittings.
6 pcs. 1-inch F.E.B. fittings.
6 pcs. 1-inch 2-hole covers for F.E.B. fittings.
6 pcs. ¾-inch F.E.B. fittings.
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4 pcs. No. 721 Bryant receptacles and J.S. base.
6 pcs. No. 14051 covers for type F.S.S. 6629 for two flush switches.
12 pcs. single pole flush switches.
500 ft. No. 10 R. C. new code wire.
500 ft. No. 14 R. C. new code wire.
1 pc No. 0-1333-O'Fallon automatic water closet, enameled iron, open front, saddle seat, enameled iron syphon wash-down bowl, galvanized flush pipe and holder, complete with trap and fittings.
1 battery of six Fig. 0-595 O'Fallon enameled iron lavatories, complete with trap and fittings, Milwaukee faucets, basin to be 12-inches by 15 inches.
3 pcs. shower headers.
8 pcs. 1-inch globe valves—brass.
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2 pcs. ¾-inch globe valves.
4 pcs. ¾-inch std. unions.
2 pcs. ¾-inch std. tees.
4 pcs. ¾-inch std. ells.
100 lbs. nails.
45 pcs. 12-inch by 15-inch by 3 ft 2 inches 2-compartment all steel lockers.

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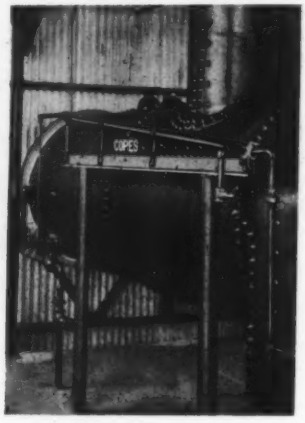

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The Copes Provides:

A simple, rugged, accurate and continuous boiler feed water input.

Even distribution of load between boilers.

Less drop in steam pressure on overloads.

Higher overload capacity.

Smooth, constant rate of feed with no spasmodic opening and closing of the feed valves.

Drier steam, since the water level cannot rise beyond a predetermined point.

Elimination of boiler priming and wet steam at the filter department.

Labor saving.

Reduced stress on boiler feed pumps, feed lines and valves.

The above statement by Mr. Baker is from an article he recently wrote on "Advantages of Boiler Feed Water Regulation in the Oil Industry." A copy of this will be gladly sent you for the asking.

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COPES
SYSTEM OF BOILER FEED CONTROL

Refinery Dismantled

East St. Louis—The refinery of the Indiahoma Refining Company at East St. Louis was recently purchased by Hyman-Michaels Company of Chicago, who will dismantle the plant and sell the equipment. The plant has been shut down for a number of years. Included in the equipment is complete skimming plant, 10,000 barrels capacity, a gas recovery system, power plant. In the tank farm there is a number of storage tanks ranging from 400 to 55,000 barrels capacity.

H. E. Ransford, formerly of the Los Angeles offices of the Signal Gasoline Company, has been transferred to the newly established Mid-Continent offices of the company at Tulsa. Mr. Ransford will have charge of the company's natural gasoline plants in this area and will assist Ray R. Rosier who is in charge of sales at Tulsa.

NORTH AMERICAN TRANSPORTATION
Driving the golden spike that joined the east with the west—Promontory Point, Utah, May 10, 1869.

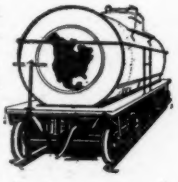
When Bonds of Steel Joined the East to the West

In 1863 the Central Pacific Railway began its extension eastward from Sacramento, Cal., already connected by rail with the Pacific Coast.

Two years later the Union Pacific began pushing its way westward from Omaha.

At noon on May 10th, at Promontory Point, Utah, the two roads met and became one. The crew from the East shook hands with the crew from the West. The first transcontinental railroad was a reality.

In the intensive development that followed, it was inevitable that car leasing should play an important part. It offered such decided advantages that its success was never in doubt. Through concentrating the operation, maintenance and repair of special freight equipment, it *provides the advantages of ownership without the disadvantages, at minimum cost.*



The history of North American Leasing Service is an unbroken record of success. Shippers using tank, refrigerator or Palace poultry cars will find it to their interest to become acquainted with the facilities that this service includes.

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Bulk Oil Warehouses, Chicago, Ill., Tulsa, Okla.
Export Terminal: New Orleans, La., Galveston, Texas

North American
CAR LEASING SERVICE

Mention Where You Saw the Advertisement

The Natural Gasoline Industry in California*

By PAUL D. BARTON
President California Natural Gasoline Association

THE freedom of the California natural gasoline industry from contract limitations on testing practice in so far as the payment of royalties is concerned, has fostered the study of the chemistry and physics of the absorption process and their practical applications. The direct result has been a gradual changing of plant and equipment design and of operating conditions as well. Producers have awakened to the importance of natural gas as a distinct product. Even those producing companies which do not operate absorption plants of their own, maintain gas departments and often have a broader viewpoint of the industry itself than some of the larger self-contained companies. Therefore, the tendency is for the producer to be more and more exacting upon the operating company in the matter of efficiency and correct methods. It is not surprising, then, that many of the contracts now being written are for definite and usually short terms. "Blanket" contracts and contracts "for the life of the lease" are becoming a distinct rarity.

*Read before convention of the Association of Natural Gasoline Manufacturers, Tulsa, May 24 to 27, 1927.

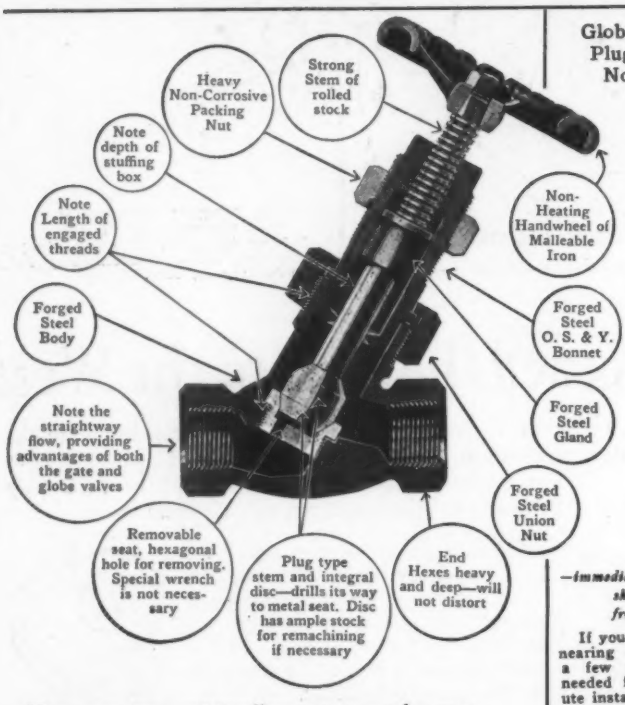
So-called "dry" or residue gas resulting from the treatment of wet gas for the extraction of gasoline, has been receiving a lot of attention from both producer and operator. It is rapidly taking on the aspect of a separate commodity and is becoming more and more rigidly accounted for. The rapidly growing proatice of producing deep wells by the gas lift method has also accentuated the necessity for strict residue-gas accounting.

Specifications by Agreement

Specifications for natural gasoline in the sense of classification by grades, are practically unknown in California at the present time. Since the greater part of the production is either owned outright by the refining companies or is being brought under comparatively long term contracts by them, specifications become a matter of agreement between the producer and the user only. The quantity of natural gasoline sold by jobbers on the open market is almost negligible. What few specifications that are in use are rather flexible, usually taking the form of limitations. Thus, 380 degrees Fahrenheit is a common upper limit for the endpoint, 72 degrees A. P. I., is the usual lower limit of gravity. Only recently have vapor pressure and distillation recovery been given much attention. Since most of the production is from oil absorption plants operating at 30-pound gas pressure, and since pipe line delivery is prevalent in the Los Angeles Basin fields, the question of stabilization has been slow to receive consideration.

Three other conditions have had an important part in the shaping of the course of the California industry. These are, first, the restricted areas of the chief gas-producing fields; second, the extreme fluctuations in gas volumes, pressures and enrichments; and third, the economics of transportation and storage of the natural gasoline production. The restricted area of the more important fields has been responsible for competitive conditions not only in the bidding for the gas contract, but in the selection of plant equipment and the determination of operating conditions. Together with these competitive

Edward Forged Steel Valves


Globe Valve
Plug Type
No. 682
Heavy Non-Corrosive Packing Nut
Strong Stem of rolled stock
Note depth of stuffing box
Note Length of engaged threads
Non-Heating Handwheel of Malleable Iron
Forged Steel Body
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Note the straightway flow, providing advantages of both the gate and globe valves
Forged Steel Union Nut
Removable seat, hexagonal hole for removing. Special wrench is not necessary
Plug type stem and integral disc—drills its way to metal seat. Disc has ample stock for remachining if necessary
End Hexes heavy and deep—will not distort

Here are two outstanding reasons why you should standardize on Edward Forged Steel Valves.

(1)—designed and built for service up to 500 pounds pressure and intermittent temperatures to 1100 degrees F.—they therefore will fit any service need within this range.

(2)—because of quantity production these high grade valves are priced LOW ENOUGH to justify their use even in service far below their maximum rating.

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Chapman Valve Mfg. Co., P. O. Box 974 Tulsa, Okla.

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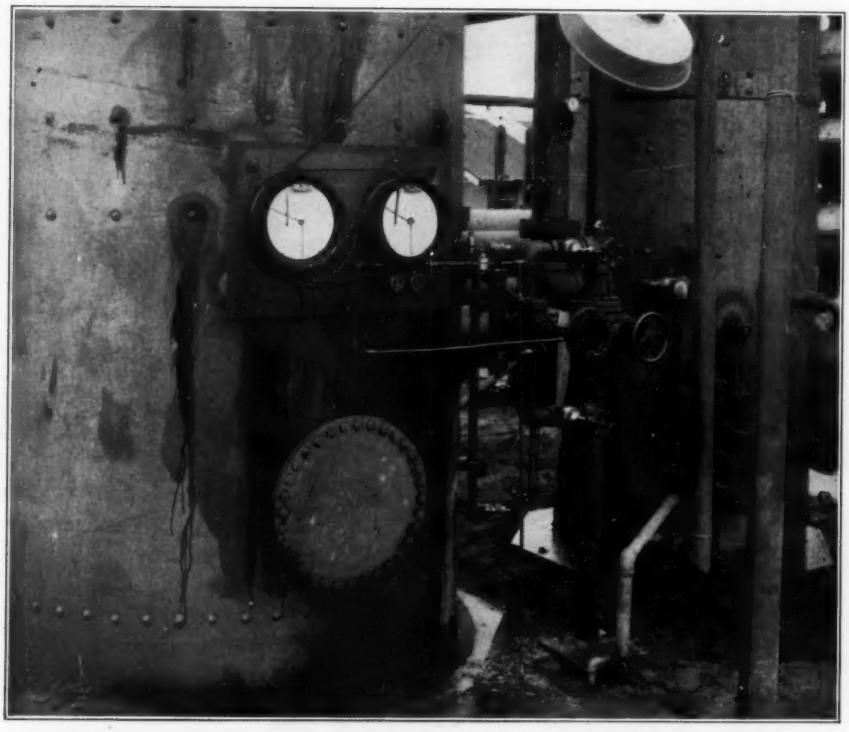
If you have a plant nearing completion—a few extra valves needed for last minute installation — an emergency arises where valves are needed quickly—wire Edward — specify "Forged Steel Valves" — immediate shipment will be made — any quantity and any size from ¼-inch to 2-inch inclusive.

Edward Forged Steel Valves are made in both Globe and Angle pattern—Plug Type or Edward Protected Seat and Disc.

Ask for Refinery catalog.

—for every refinery service



FOXBORO TEMPERATURE RECORDER-CONTROLLER INSTALLED ON ABSORBERS, AMERADA PETROLEUM CO., EARLSBORO, OKLA.

Foxboro Still Control

Thumbs down on rule-of-thumb methods is the trend in refinery practice today. Foxboro Instruments are rapidly replacing guesswork in the control of critical processes.

The Foxboro Automatic Temperature Recorder-Controller is widely used for controlling still operation. A simple clock key sets the control lever to the exact degree of temperature desired. No other manipulation is necessary. The instrument does the rest. Fractions are cut according to schedule; reruns don't figure in the picture. Production goes up. Costs go down. Plant efficiency ceases to be a dream.

Foxboro Instruments are nationally famous for their accuracy and dependability. Thousands are used in the Oil Industry but many more thousands are used in hundreds of other industries. Their reputation is based upon their unfailing ability to perform accurately and dependably under any and all conditions.

Foxboro Instruments are guaranteed permanent in calibration and are accurate to within less than 1 per cent of total scale range. Get in touch with our nearest branch office.

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205 So. Cheyenne Avenue, Tulsa, Okla.

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Instruments for Indicating, Recording and Controlling Temperature, Pressure, Humidity and Flow

Mention Where You Saw the Advertisement

conditions, the extreme fluctuations in gas volumes, well pressures and enrichments, have brought out the utmost ingenuity for both flexible and efficient operation without having to overbuild for flush production.

Capacity Variation

The type of extraction plant which has resulted from this development is highly interesting. The outstanding feature is the great overload capacity of the various plant units without appreciable falling off in efficiency. This is due mainly to the careful design of the individual parts of the plant, with particular regard to the capacity range of each, correlated to the capacity ranges of the other parts of the plant. Such a plant can vary its output over a very wide range with hardly noticeable change in extraction efficiency. A logical development of this principle of flexibility has been the unit type of plant, followed by the portable and the compact factory-built plants. The larger permanent installations have evolved into a more complex type, combining the self-contained unit idea with the battery type of construction.

With Oklahoma and Texas together producing only a little over one-half of the nation's natural gasoline, it is interesting to note that California is the chief source of the rest of it. In fact, nearly two-thirds of that other half is being produced in California. Our largest producer has a daily output totaling approximately 400,000 gallons. The average production of all plants in the State is in the neighborhood of 10,000 gallons per day. Several plants are in the 50,000 to 100,000-gallon class, and in all there are about 150 producing plants.

PAUL D. BARTON
Prominent in Natural Gasoline Circles on the West Coast and secretary of the California Natural Gasoline Association.

Production of natural gasoline in California has been increased during the past year at a considerable higher rate than the consumption. Reported amount in storage has been gradually building up until it is beginning to approach a month's normal supply, while a year ago it only totaled an amount approximately equaling five days' consumption. With several fair sized plants under construction, the situation is becoming more serious. The only source of relief seems to be through a drastic program of curtailment in production. Some of the larger companies have already started this. The way in which this curtailment is being brought about is through controlled operation as regards the quality of the gasoline. A smaller total gallonage of a far more stable product is the ideal towards which the industry is working. If it is necessary to store large quantities of natural gasoline, then the quality of the product must be such that it can be stored economically. It has been estimated that the curtailment in production by this method would in itself be sufficient to bring about an economic balance between output and consumption.

Organization Educational

A recent development which bids fair to have a more and more far reaching influence in the California industry is the organization of men vitally interested in natural gasoline, which had its inception a little over a year ago and which is known as the California Natural Gasoline Association. Being, primarily, an organization of individuals, its work is chiefly educational. Good fellowship among the members is going a long way toward breaking down the old ideas of secrecy. The ideal of the founders was to provide a common meeting ground where the men in the industry could freely discuss their problems and co-operate in their solution. It was their belief that most of these problems are of common interest to

One of our Spray Nozzle Cooling Systems in operation at the plant of a Louisiana oil refinery. This spray pond is equipped with our Impact Type spray nozzles.

Spray Ponds for Refining Plants

THAT we make cooling towers is known by most refining plant engineers. We also manufacture spray nozzles and design spray nozzle cooling systems. We can design such a system for your plant and equip it with either our IMPACT nozzles shown in the above photograph or with our new SPIRODOME nozzles.

Write for Literature

Our company is composed of engineers whose long experience with cooling water problems entitles them to your confidence. We have designed and built cooling towers and spray nozzle cooling systems for firms like Marland Refining Company, Union Oil Company, Roxana Petroleum Company and others equally well known.

THE COOLING TOWER COMPANY, INC.

15 John Street — New York

Houston, Texas — The J. A. Rossiter Co., 410 Union Nat'l Bank Bldg.

Tulsa, Okla. — J. F. Pritchard & Co., 910 Mid-Continent Bldg.

Shreveport, La. — Pelican Well Tool & Supply Co.

Los Angeles, Calif. — N. O. Fleming Co., 5815 Maywood Ave., Huntingdon Park

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Guardians of the Pipe Lines

Why Williams Valves Stand First

Where the smoke of thousands of chimneys tell of the restless activity of the world's mightiest industries you will find Williams valves guarding the pipe lines.

In the great steel mills of the Pittsburgh and Bethlehem districts—in the refineries—shipyards—railroads and central station plants valves are installed on merit alone. Here they know metals; here they know workmanship; here, where service is most severe, tests most scientific and records most accurate, Williams valves are installed BECAUSE THEY MAKE GOOD IN EVERY WAY.

Known generally as the extra heavy line of valves, men of experience also know that this extra material is so perfectly distributed and of such superior quality that Williams Valves are really the most economical in the long run.

Until you use Williams Valves you cannot appreciate how much they will contribute to the prosperous and economical operation of your plant.

They are made in many types and sizes to suit most every industrial or power requirement.

Our dealer in your territory can supply your needs promptly

The D. T. Williams Valve Company

Cincinnati, Ohio.

Makers of High Grade Bronze and Iron, Regrinding and Nickel Seat Stop and Check Valves, Gate, Blowoff, Hydraulic, Swing and Ball Check, Needle, Hose, Whistle Valves, Stop and Air Cocks, Unions, Fittings, Water Gauges, Gauge Cocks, Oil Gauges, Lubricators, Oil and Grease Cups, Steam Traps, Separators.

Williams Regrinding Valves, No. 107 is one of the Williams Superior types that has built the Williams reputation for long, dependable service throughout industry. Discs and seats extra heavy, special metal, machined for a **tight bearing.** Seat may be reground with a little oil and emery; a few moments' work, and the valve is like new. No extra discs ever required, making an important saving. Stem, extra heavy and strong, of best bronze. Will not bend or break. All threads engaged when valve is closed, preventing stripping or unequal wear. **Exclusive** feature with the **Williams.** May be repacked under pressure with absolute safety. Sustains 200 lbs. pressure easily.

Install ONE and let it prove its value.

the industry as a whole and that its advancement would be furthered by such an interchange of ideas.

In conclusion, it may be said that the California natural gasoline industry has a tendency to exchange information and standardize practice as far as possible. More than ever before, changes are taking place on the basis of established principles, a friendly and helpful attitude being shown in the working out of the common problems of the industry. The secret of the advancement made by the California industry has been in the general willingness to experiment and to exchange ideas.

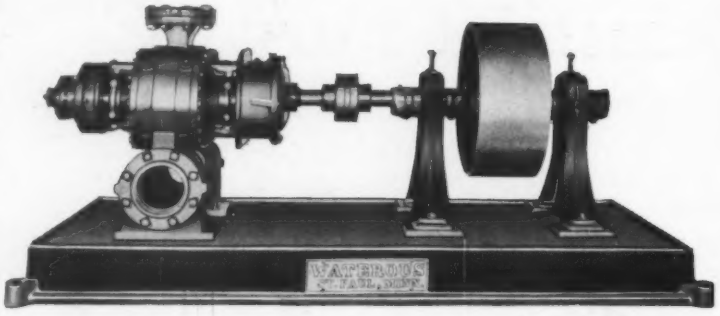
NEW CATALOGS

De La Vergne Diesel Engines are the subject of a booklet announced by the De La Vergne Machine Company, 977 E. 138th Street, New York.

The bulletin is a technical supplement to the Diesel Engine catalog. It presents the De La Vergne Vertical Solid Injection Diesel Engines, and gives extensive details on this prime mover.

Copies will be mailed from the company, upon application.

THE WATEROUS ROTARY PUMP



The Waterous Is of Clean Cut and Simple Design Throughout

There is a marked absence of small and complicated parts—this means low operating costs!

In addition to being simple, this pump has unusually high efficiency characteristics.

You will find the Waterous the cheapest rotary pump available from the standpoint of dollars per pump horsepower hour.

Complete information for the asking.

Pressures to 300 lbs.

Capacities to 2000 G. P. M.

Applications for representation in open territory will be considered from responsible parties.

WATEROUS COMPANY

SAINT PAUL, MINNESOTA

New York City Office: 342 Madison Ave.

Also Manufacturers of the Waterous Fire Hydrant

Leeds & Northrup Company, Philadelphia, has two bulletins, recently released from the press, for free distribution to any one interested.

No. 660 is called Automatic Combustion Control for Boiler Furnaces. The bulletin describes how measured quantities of air and fuel are fed to each boiler in an exact and predetermined ratio and in immediate response to station load demand. Equipment for this work is also described.

No. 781 illustrates and gives detailed descriptive matter on Leeds & Northrup Carbon Dioxide Meters.

Copies of either bulletin will be mailed on request to the company.

Schutte & Koerting Company, Philadelphia, announce their diffuser steam purifiers in bulletin No. 9-P.

This equipment was designed to remove from steam and vapor the moisture, dirt and other impurities which interfere with proper operation of the equipment in which this steam or vapor is used.

Copies of the bulletin will be mailed on request to the company.

The Mine Safety Appliance Company, Pittsburgh, announce a new bulletin featuring the McCAA-2 Hour Oxygen breathing apparatus. This outfit enables the wearer to work two hours in dangerous quantities of gas, smoke, or in general where deficiencies in oxygen may exist. Copies of the bulletin will be mailed on request to the company.

The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, manufacturers of electrical measuring instruments, have recently released a new catalog, No. 20. This publication is entitled "Galvanometers," and embraces the entire line of these instruments made by the company. Copies will be mailed on request.

Vogt products for the refinery are described and illustrated in Bulletin R-E4, published a short time ago by Henry Vogt Machine Company, Louisville, Ky.

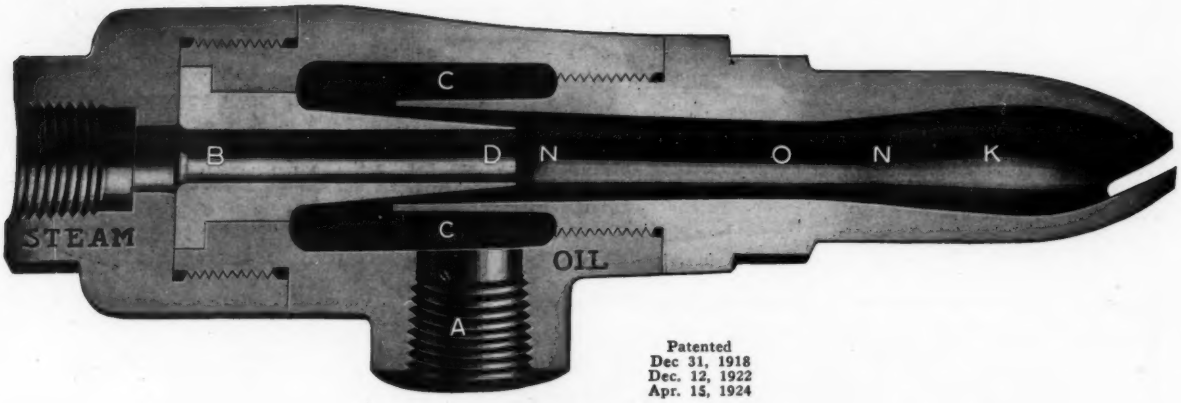
This catalog features high pressure stills, water tube and return tubular boilers, complete wax plants, refrigerating machinery, drop forged steel valves and fittings, and auto truck tanks.

Copies will be sent upon request to the company.

The Bristol Company, Waterbury, Conn., is distributing a new catalog, No. 1502, devoted to recording ammeters. All the types of ammeters handled by Bristol are featured in the publication, copies of which will be mailed on request.

Bethlehem Foundry & Machine Company, Bethlehem, Pa., is now distributing Bulletin F-14, describing Wedge mechanical furnaces for revivifying ful-

National Airoil Burners



Patented
Dec 31, 1918
Dec. 12, 1922
Apr. 15, 1924

For Power Plants and Stills and all Industrial Furnaces

NATIONAL AIROIL BURNERS
are internal atomizing burners—inside mixers —operating with either steam or compressed air; and burn as steady as a gas flame with any grade of fuel. Set your fire the way you want it, and it will burn the day through without watching or readjusting.

NATIONAL AIROIL BURNERS
will handle the heavy residuum from cracking stills without requiring continual removal for cleaning, an immense factor in economical plant operation.

NATIONAL AIROIL BURNERS
when operating under boilers will use less than one per cent of the steam for atomizing the oil. The old style steam atomizing burners use from three to seven per cent.

NATIONAL AIROIL BURNERS
give a soft gaseous flame that does not injure brick work or boiler tubes. Made with flat or round tips.

Write for our Bulletin No. 21

National Airoil Burner Company

Factory: S. W. Cor. 9th and Thompson Sts.
Sales Rooms: 1327 Girard Avenue
PHILADELPHIA, PA.

Oil Burners and Oil Burning Equipment

ler's earth. These furnaces are now being used with much success by some of the largest refiners in this country.

The object of treatment of fuller's earth in these furnaces is to remove or burn out adsorbed impurities, mainly carbonaceous matter, and at the same time avoid altering or destroying its original cellular structure upon which the bleaching or decolorizing properties depend.

Copies of the bulletin will be mailed by the company, on request.

International Oxygen Company, Newark, N. J., has a new catalog devoted to welding and cutting equipment sold by that company. Copies of the catalog will be mailed on request.

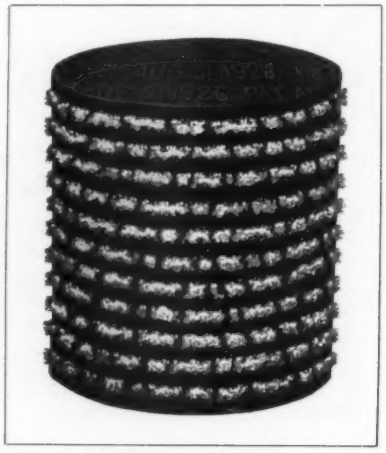
Cord Plug For Cleaning

THE GARLOCK PACKING COMPANY

The Garlock Packing Company, Palmyra, New York, is now marketing a cord plug for condenser tube cleaning.

The cord plug is manufactured of resilient rubber and many long brush cords. The cords are insulated from each other by a rubber film. The ends of the main staggered cords extend beyond the cylindrical wall of the plug and set up frictional resistance to the inside surface of the tube.

More information will be supplied by the company, on request.



GARLOCK CORD PLUG

Enlarge Plant

Summerland, Cal.—The Seaside Refining Company is enlarging and improving the equipment of its refinery here. Formerly this plant produced only asphalt from heavy Summerland crude. The new equipment being installed will consist of facilities for the manufacture of gasoline, kerosene, and fuel oil, to be dispensed to the trade in that territory. At present the company is furnishing the Goleta crude, but under the new arrangement part of this production will be refined at Summerland.

A meeting of employes of the Chestnut & Smith Corporation in the Ranger-Breckenridge district of Texas is to be held August 18 in the Ranger office. There will be two papers, one on safety and the other on First Aid. Authors of the papers will be announced at the meeting. These monthly meetings are a regular thing in this territory of the Chestnut & Smith Corporation. Four superintendents are selected as a committee to arrange the meetings and Otto Peters of the Hanlon plant at Breckenridge, is chairman. Other committee members are Charles Edwards, R. E. Beasley and J. M. Holloway.

Claude C. Brown has been appointed gas administrator for Southern California. His post is under the supervision of the California Railroad Commission. Formerly he was gas engineer for the railroad commission, a post he held for four years. Previous to that he was with several of the larger gas and electric utility concerns of California. As gas administrator he will have the work of allocation and designation of the use of all natural gas available to the major gas utilities in Southern California, as well as the physical supervision of the operation of their oil gas plants.

SPEED!
Immediate Shipment
Rapid Erection
Any standard Fluor tower of moderate size can be shipped in one week or less, if required. Interchangeability of parts and accurate factory fabrication insure maximum speed in erection.
FLUOR CONSTRUCTION COMPANY
Constructors and Engineers
909 E. 59th St., Los Angeles, Calif.
502 National Bank of Commerce Bldg., Tulsa, Okla.
FLUOR
REDWOOD
COOLING TOWERS

Coming

The

NEW CLARK SUPER '2' CYCLE *Compressor*

with the Clark Fuel-Injector—which establishes a standard of 2-cycle efficiency & economy heretofore considered impossible

Watch for announcement soon

Mention Where You Saw the Advertisement

Extra Strength

Replace parts that give you trouble with aluminum bronze.

Its strength is approximately the same as steel. It has unusual resistance to shock and fatigue.

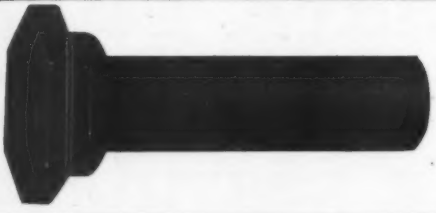
It is also corrosion and acid resisting, an ideal material for many parts in oil refinery equipment.

This company furnishes studs, holding-down bolts, valve guides that are apt to come in contact with acid or salt water.

We will cast and machine these to your specifications. Send blue prints for estimates.

DBC

Buffalo Bronze Die Cast Corp.
100 Arthur St. Buffalo, N. Y.



78 Oil and Refining Companies now using the

Mettler Entrained Combustion Gas Burners

For All Purposes, Kinds of Gas, Pressures

Write for Latest Condensed Catalog

Lee B. Mettler Co.

406 S. Main St. Los Angeles, Cal.

Tidal Operating Tube and Tank Unit

Tulsa.—The Tidal Refining Company has started the operation of its Tube and Tank cracking unit at its Drumright, Oklahoma, refinery late in July. The units have been under construction for some time, but were not hastened to completion because of unfavorable market conditions. Two units have been installed, each of which has a capacity of 1500 barrels daily.

The Tube & Tank process is owned by the Standard Oil Company of New Jersey and licensed by that company. These are not the first units of this type to be installed in the Mid-Continent field. The Humble Oil & Refining Company has been operating its Tube & Tank units at Burkburnett, Texas, during the last four years. Other units of this process are in operation at the refinery of the Louisiana Oil Refining Corporation at Shreveport. In the Gulf Coast territory the Humble Oil & Refining Company has a large battery of 26 Tube & Tank units in operation at its Baytown plant.

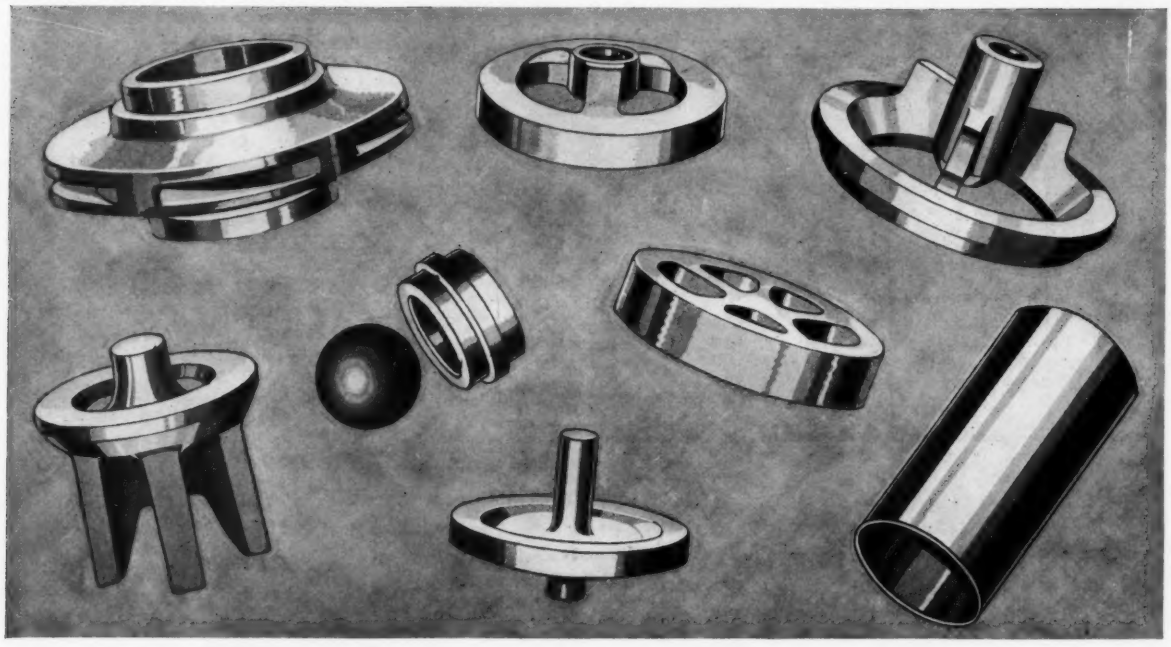
Amarillo, Texas.—The Sullivan Refineries, Inc., with refining plants at Clovis, N. M., and Dayton, N. M., was recently purchased by the Colfax Refining Company of Indianapolis. The Colfax Company plans to operate the two refineries using crude from the Roxana-Bryan area of Carson County, Texas. M. N. Ulmer, who assisted Bruce Sullivan in construction of the plants is to be manager, C. B. Ullum is manager of sales, and E. S. Horner, Tulsa, is superintendent of plant operations.

Increase Capacity

Shreveport—The Texas Company, operating a compression type natural gasoline plant at Naborton, La., is doubling the capacity of the plant through the installation of a Southwestern portable absorption gasoline unit. This was made necessary because of a recent increase in the volume of gas treated in the plant, accompanied by a decrease in the gasoline content, making an absorption type plant necessary.

Tulsa.—Roxana Petroleum Corporation is installing a new natural gasoline plant at Oxford, Kansas. The plant is the absorption type having a rated capacity of 4,000,000 cubic feet of gas daily, but constructed in such manner that it may easily be increased to 8,000,000 cubic feet per day.

Roxana recently began operating a new absorption gasoline plant in the Bowlegs pool of the Seminole area.



Pump Parts
where corrosion is constant

Used for years, Hills-McCanna alloys are superior for pump parts, trimmings, valves, valve seats, piston rings, or any parts subjected to continual contact with hot oil or vapors.

Our No. 45 alloy is particularly adaptable to this service. It is a pressure metal, free from porosity. Castings from it are dense, smooth, close grained, light in weight and strong. It does not grow upon repeated heating and cooling—its co-efficient of expansion is 50% greater than steel.

An entire device may be constructed of it without fear of electrolysis or galvanic action.

Send in your inquiries for castings requiring these essentials. Our facilities for serving you are complete from the production of patterns to turning out the finished product ready for installation.

HILLS-McCANNA CO.
2029 ELSTON AVENUE CHICAGO, ILLINOIS

Mention Where You Saw the Advertisement

Construction Details for Holder for Uncondensable Still Gases

(*Continued from page 52*)

or cross-rods to resist the strains imposed upon the guide-frame by wind pressure.

These diagonals for the lower panel of the guide-frame consist of two 2½ x 2 x 5/16 inch steel fillet angles, each weighing 4.5 pounds per lineal foot, and for the upper panel, two 2 x 2 x ¼ inch steel fillet angles, each weighing 3.2 pounds per lineal foot.

At each end of the diagonals and where they intersect, there are provided web-plates for securely connecting same to guide-frame and to each other.

Erected from the top of the foundation to the top of the tank and from the top of the tank to the top of the guide-frame is a steel ladder, consisting of two 2½ x 2½ x 5/16 inch steel fillet angles, with rungs of ¾ inch diameter round bars, spaced about 12 inches apart.

The holder is also provided with two 12 inch pipe connections for gas inlet and outlet, consisting of two 12 inch diameter cast-iron drip pots, and two 12 inch diameter cast-iron shoe-elbows, the necessary 12 inch diameter cast-iron horizontal pipe between drip-pots and shoe-elbows and the required 12 inch diameter cast-iron riser pipe inside of the steel tank. The connections to the bottom of the tank were made in such a manner that the shoe-elbows could be removed without disturbing the water in the tank.

Material

A few words concerning the material used in building the gas holder at Parco should be of interest to those readers who at some time may find it necessary to devise purchasing specifications for the construction of the same or similar equipment.

All the plate, sheet and steel entering into the construction of the tank proper, holder and guide-frame was such as conformed strictly to the Manufacturer's Standard Specifications the weights per square foot for the plates and per lineal foot for the structural shapes determining the thickness of same.

All plates 3/16 inch in thickness and heavier, with the exception of those sheets entering into the shell of the tank, were of the best quality of open-hearth steel, having an ultimate tensile strength of from 52,000 to 60,000 pounds per square inch. The plates used in the shell of the tank were of a quality known as open-hearth flange or boiler steel, having an ultimate tensile strength of from 55,000 to 65,000 pounds per square inch.

The bars and structural shapes used were of a medium open-hearth steel. The holder sheets of No. 7 B. W. G. and lighter also were of open-hearth steel, but, further, were blue-annealed, presenting a smooth surface and clean finish and, in all cases, being properly hammered or rolled and accurately punched.

All rivets were of the best quality for the particular purpose for which they were to be used. Those rivets ½-inch in diameter and larger used on the tank and holder were of a quality known as "boiler" quality; while those ⅜ inch in diameter and smaller were of the contractor's standard "gas holder" quality and were driven cold.

The rivets used in the tank were made from basic open-hearth steel, having an ultimate tensile strength of from 45,000 to 55,000 pounds per square inch; elastic limit of not less than one-half of the ultimate tensile strength and elongation of 25 per cent. cold and quench bends of 180 degrees flat upon itself without fracture on outside of bent portion.

Testing

Before the gas holder being described was accepted from the contractor by Producers and Refiners Corporation, the tank was filled with water, after which the holder was filled with air and all rivets and seams thereupon tested with soapsuds. Upon the completion of the test, any leaks found were stopped.

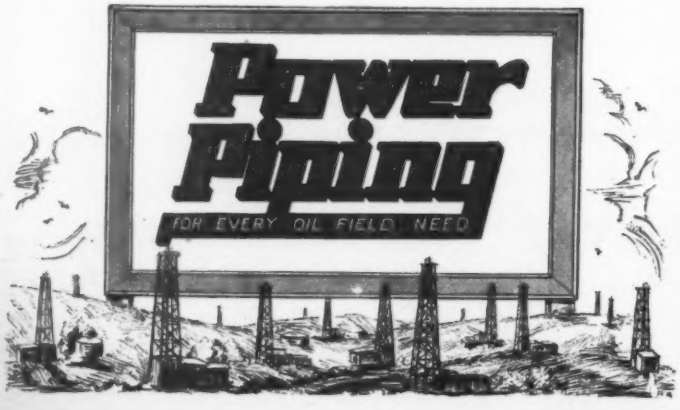
One of the conditions under which the construction contract was given was to the effect that, when the work was completed, the tank was to be practically cylindrical and water-tight; the holder, gas-tight; and, further, that holder would ascend or descend in a level or horizontal plane without binding. Also, the guide-frame was to be practically plumb and properly and securely connected, the car-

Years of Experience

Welded expansion drum, 60" diameter.
Tested to 300 lb. hydrostatic pressure.

YEARS of experience in serving power plants on small jobs and large, make it possible for *Power Piping* to promise speedy, dependable service at the lowest possible cost on any work involving design, fabrication or erection.

POWER PIPING CO. • PITTSBURGH



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Process of Gasoline Recovery

MAKES

Better Natural Gasoline

Color *Crystal clear* — no off color gasoline.

Recovery *Above average* for Natural Gasoline of the same gravity. Charcoal Gasoline is more stable. Selective absorption takes care of that.

End Point *Always low.* The Charcoal Process will not make high end point gasoline. There is no need for end point control on a Charcoal Plant.

Charcoal Process users sell specification gasoline that meets the demands of discriminating buyers. Right now, that is vitally important.

Why Not Use A Process With These Advantages?

GASOLINE RECOVERY CORPORATION
CHARLESTON, W. VA.

TULSA
423 Wright Bldg.

LONG BEACH
Box 321

How Do You Maintain Temperature?

DO YOU use the old-time method of guessing at temperatures, or are you using a thermometer and adjusting valves by hand? Then your products are not uniform and they are being subjected to damage and loss.

Guessing is gambling. It is costly and wastes time of employes.

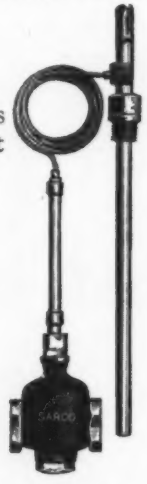
Modern plants are solving the temperature regulation problem with Sarco Automatic Temperature Regulators. Set a Sarco to any definite temperature between 30° and 300° F.—and forget it. Works on steam, gas or hot water.

Is entirely self-contained. Requires no outside attachments or operating medium, such as electricity, compressed air or water pressure.

30-Day Free Trial

Let us send you a Sarco on free trial. If it does not sell itself, return it and the trial won't cost you a cent.

Booklet No. S-96 sent on request.



SARCO CO., Inc.

183 Madison Avenue, New York

Boston Chicago Detroit
Buffalo Cleveland Philadelphia

Adolf Frese Corporation, Los Angeles

SARCO Temperature Regulator

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Manufacturers of

"SOCO" STATIONARY AND REVOLVING VENTILATORS

For Refinery And Natural Gasoline Plants

Oil Field Work A Specialty

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riages properly adjusted and the tank filled with water, subsequent to which the holder could be filled with gas.

These conditions as mentioned were met in their entirety upon an inspection of the completed work.

The only guarantee required of the contractor was that all material and workship entering into the gas-holder should be first class in every particular and that, if not, he would agree to repair and to make good any defects that might develop in the materials or workmanship within one year after date of completion.

Painting

All material entering into the construction of the tank received a good coat of linseed oil before it left the works, and a single coat of paint on the exterior surface during erection.

The interior of the top course of shell plates of the tank, for a depth of two feet, received one coat of paint during the erection of the tank. The bottom of the tank, on the underside, received a good coat of paint before it was lowered in position on the foundation. All the material entering into the construction of the holder and guide-frame received one coat of paint before it left the factory.

After completion of erection, the whole exterior of the tank, holder and guide-frame was given a final coat of gas-holder paint.

General Remarks

Because the general conditions under which this gas-holder was built are typical of those existing between contractor and purchaser when the same or similar equipment is erected, the following points are mentioned concerning the agreement made in the construction of this particular gas-holder as a guidance to others who may at some future time find it necessary to contract for the construction of a similar piece of work:

1. All material required for scaffolding was furnished and removed by the contractor.

2. The purchaser constructed and built a suitable level foundation complete in all its parts, said foundation being of sufficient diameter and dimensions to fully accommodate and sustain the gas-holder construction complete when in use; the purchaser also furnished, adjacent to said foundation, a mixture of sand and cement in proportion of one part cement and three parts dry, clean sand, in quantities sufficient to spread on the foundation to the thickness of about one inch. The spreading was done by and at the expense of the contractor. The purchaser was responsible for the gas-holder foundation and had any damage occurred to any part of the gas-holder through failure of the foundation to support properly the weight of the gas-holder and contents, the purchaser agreed to assume all extra charges incidental to correcting the work.

2. The contractor agreed to unload all necessary material from the cars, with the further understanding that if the holder was located more than one hundred feet from the railroad siding, the purchaser would transport the necessary materials and tools to the site, and, upon

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STEAM GAGE & VALVE CO.
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Now Completely Stocked by
WESTCOTT & GREIS, Inc.

We are now prepared to offer the Industry a complete service on Crosby Gages and Valves, ample stocks of which are carried by us in our Tulsa warehouse for immediate shipment to all parts of the Oil Country.

THE CROSBY DOUBLE SPRING PRESSURE GAGE, Style AR shown below is a scientifically designed instrument, precisely made to furnish accurate and dependable service. With standard graduations from 100 to 1000 lbs. A double tube instrument, rolled, machined tubes, screwed ends instead of soldered; milled sector and pinion—sector has wide bearing surface. Cannot run off pinion, and, on account of wide surface, will not mill its way into pinion. This gage will give from 50 to 100 per cent longer service.

THE CROSBY RELIEF VALVE, Style JJ, lower right, is designed for extreme service under high pressures and temperatures where very high capacity is required. Will not choke or stick. Unequalled for resistance to corrosion, erosion, and high temperature. Extensively used on oil lines, hot and cold, and on pressure stills and cracking coils.

For complete information on Crosby Safety and Relief Valves, Blow-Off Valves, Globe and Angle Valves, Indicating and Recording Gages, Gage Testing Equipment, etc., write for catalog to CROSBY STEAM GAGE & VALVE COMPANY, BOSTON, MASS., or

WESTCOTT & GREIS, Inc.
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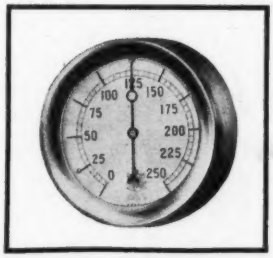
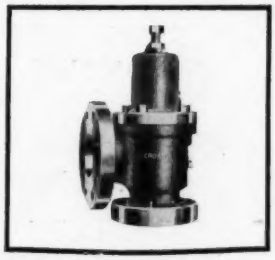


CROSBY PRESSURE GAGE



CROSBY RELIEF VALVE

WESTCOTT & GREIS INC. W&G MEASUREMENT & CONTROL

completion of the work, the construction tools from the site to the railroad siding, free of expense to the contractor.

4. The purchaser agreed to bear any local spotting or switching charges made by the railroad or private company.

5. The purchaser also agreed to keep the foundation free from water at all times until the contractor had lowered the tank bottom on the foundation; and, likewise, the adjacent ground surface until the holder had been completed.

6. The purchaser further agreed to provide, adjacent to the site of erection of said gas-holder construction, sufficient ground or space for the contractor's use as was required for storing material and tools, erection of tool shed and all requisites for the proper erection of said holder and shell; also to provide, around the entire foundation, ample working space at least fifteen feet wide for scaffolding, etc., and for properly distributing material around the tank.

7. The purchaser also agreed to furnish a plentiful supply of fresh water at all times, at a pressure of twenty pounds or more per square inch, at the holder site, such water being suitable for power purposes. Incidentally, the water used in filling the tank for a test, upon the completion of the work, was furnished by the purchaser and all expenses in connection with making the test were likewise paid by the purchaser—it having been specifically agreed beforehand that the test was to be made within two weeks after notification of the contractor's representative in charge of the erection of said gas-holder that the tank was ready to be filled with water.

8. The purchaser also agreed to furnish and to install all steam piping and steam hose; also, to provide sufficient steam from the refinery boiler plant to the holder as may be required to prevent (by use of same should severe cold weather set in before the guide-frame has been completed) the water in the steel tank and hydraulic cups of the holder from freezing, after the holder has been temporarily put into use by the contractor's erectors for the purpose of using it as a scaffold from which to complete the erection of the upper sections of the guide frame.

9. The purchaser further agreed to obtain, free of expense to the contractor, any permits, surveys and inspections as may be required by the Borough, City, County or State Officers.

10. The purchaser also agreed to receive, properly take care of and to store, at the contractor's expense, except as previously specified, any materials required for the construction of the gas-holder that arrived in Parco before the contractor's Superintendent of Erection was on the ground.

11. The purchaser also agreed to provide a boarding and lodging place, within one-half mile of the site of the holder, at which place all men employed in the construction of the gas-holder could obtain board and lodging at a rate not to exceed $1.50 per day.

12. The purchaser further agreed to furnish, free of expense to the contractor, natural gas or gasoline in sufficient quantities to operate the contractor's equipment during the whole time of construction of the gas-holder installation.

From the detailed description of the construction of the 100,000 cubic foot gas-holder erected at the Parco refinery, and the conditions under which it was built, the interested reader will find himself able, when occasion arises, to prepare suitable purchasing specifications for the construction of the same or similar equipment, using the information given in the present article as a basis.

for Southwestern Refiners

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Elgin Butler Brick Co., Austin, Texas

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. . . . fire brick of the exact refractory efficiency for each need

. . . . and at a lower freight cost—the result of local manufacture!

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Texas Fire Brick

Write any Member for Figures on Your Requirements.

Texas Fire Brick Manufacturers Association

Promoting Texas Fire Brick Economies.

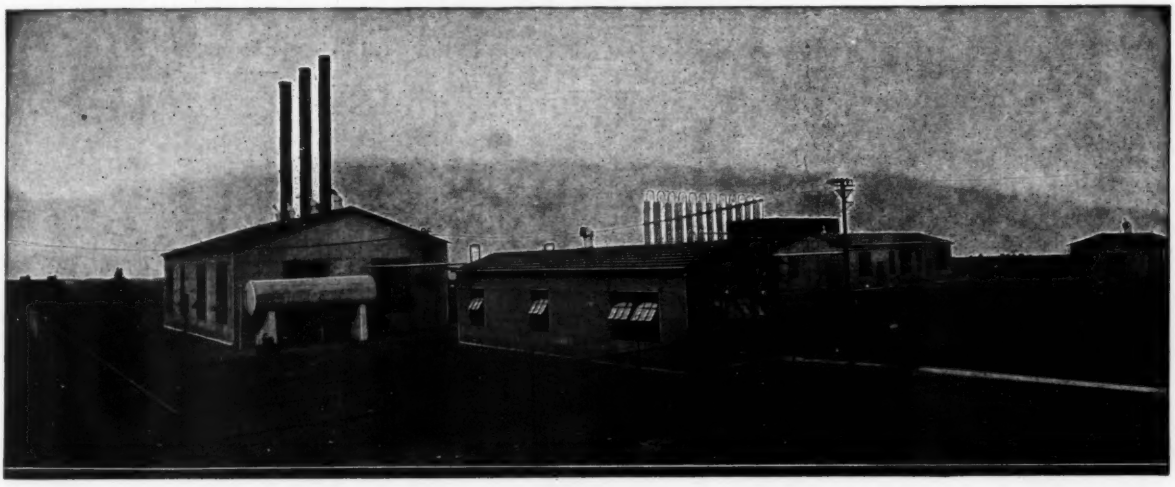
Committees Shaping N. P. A. Anniversary Meeting

(Continued from page 50)

Refining Co., Tidioute, Pa.; Henry Hauseman, Pure Oil Co., Chicago, Ill.; J. F. Heilman, Levi Smith Refining Co., Clarendon, Pa.; D. W. Hovey, Waverly Oil Works, Pittsburgh, Pa.; C. J. Leroux, Paragon Refining Co., Toledo, Ohio; Harry R. Lewis, Conewango Refining Co., Warren, Pa.; L. B. McCammon, Transcontinental Oil Co., Tulsa, Okla.; W. A. McCafferty, Emery Manufacturing Co., Bradford, Pa.; Samuel Messer, James B. Berry Sons' Co., Oil City, Pa.; J. B. Miller, A. D. Miller Sons' Co., Pittsburgh, Pa.; P. M. Miskell, Empire Refineries, Tulsa, Okla.; T. M. Murphy, W. H. Dougherty & Son Refining Co., Petrolia, Pa.; Wm. Schwartz, Warr-Penn Refining Co., Warren, Pa.; F. B. von Tacky, Titusville Oil Works, Titusville, Pa.; and G. G. Woodruff, Roxana Petroleum Corp., St. Louis, Mo.

TRUSCON BUILDINGS

OF COPPER STEEL



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These permanent, non-combustible buildings can be shipped to you immediately right out of stock. They consist of standardized units of rust-resisting copper steel and are easily and quickly erected. Should it become necessary to change your plant location, these buildings by Truscon can be readily dismantled and re-erected elsewhere without loss. They are by far the most economical and practical construction for the money invested. Truscon Buildings are being used throughout the Oil Industry for a wide variety of purposes. Suggestions, information and estimates for a single building or an entire plant individualized to your exact requirements furnished without obligation.

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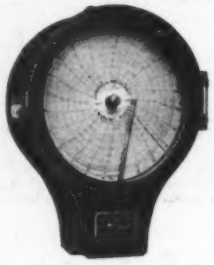
Model No. 340—Bristol's Recording Thermometer with moisture proof case.



Model No. 11—Bristol's Recording Pressure Gauge.

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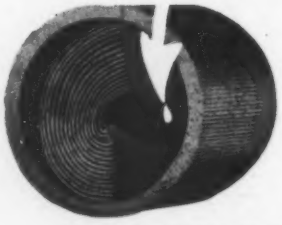

That's why Hood's Chemico Spiral Packing Rings have been selected by so many engineers. The center hole prevents choking and clogging.

Made of acid-resisting shale—practically indestructible.

Used by all big producers because of the intensive movements.

Samples on request.

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Los Angeles.—A new gasoline plant in the Ventura Avenue field, California, is announced by the Bolsa Chica Oil Company. The plant is designed to produce 20,000 gallons daily. At present natural gas for the plant will be derived from two wells, with sufficient gas to yield about 7000 gallons daily. As new wells are brought in the output from the plant will be increased.

Amarillo.—A new refining company to be known as the Texarillo Refining Company, plans to build a new plant here in the near future. The plant is to cost around $200,000 and to have a capacity of about 5000 barrels daily. Dorset Carter, president of the Pantex Pipe Line Company, and Col. Ernest Thompson, of Amarillo, are behind the movement to construct the second refinery in this city. It is being financed by Amarillo capital.

Wichita Falls.—The 2500 barrel skimming plant of the Interstate Gasoline Company, Iowa Park, Texas, will be offered at public sale in Wichita Falls, June 20. The plant is located at Iowa Park on the Fort Worth and Denver Railroad, and on the main highway leading west from Wichita Falls, Texas. The plant is connected to the pipe line systems of The Texas Company and the Wichita Pipe Line Company. It has been shut down for the past three years.

The American Refining Company, with cracking and skimming plants at Wichita Falls, Texas, announced during the month the addition of two new departments to the manufacturing end of the business. These departments will have charge of paving asphalt production, and cleaners' naphtha. C. J. Holland is in charge of all manufacturing departments for the company.

North Texas Refiners Specializing in Solvents and Naphthas

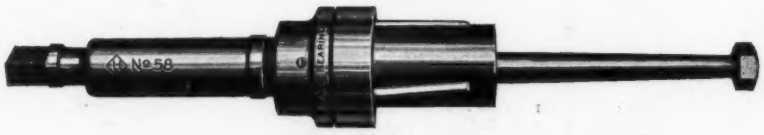
(Continued from page 49)

tower temperature and lowered reflux feed. The Engler distillation range is as follows:

IBP	320° F.
5%	328° F.
10%	335° F.
20%	342° F.
30%	348° F.
40%	353° F.
50%	360° F.
60%	368° F.
70%	377° F.
80%	389° F.
90%	409° F.
95%	428° F.
E. P.	450° F.
Gravity	48/50
Color	Plus 25 Saybolt
Doctor	Negative
Corrosion	Negative
Odor	Fair
Dist. Loss	3% or Under

Most of 48/50 gravity naphtha is purchased for blending with products of natural gasoline plants where it is made into an excellent product meeting navy specifications or finds its way into other fields of usefulness for which it is especially suited.

HEAVY DUTY EXPANDERS FOR STILL TUBES



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Established 1870 Expanders since 1884

Universal Mist Extractor

Endorsed and adopted by Producers, Refiners and Engineers BECAUSE

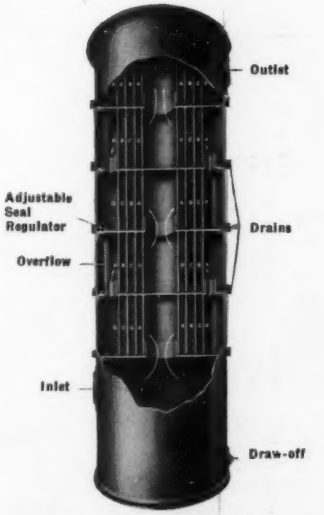
It provides CLEAN gas for the Absorption or Casinghead plant.

Does away with LIVERED absorption oil.

PREVENTS stills from FOAMING.

It insures CLEAN gas for distribution lines and ADDITIONAL OIL for the producer.

Removes WATER from gas leaving Charcoal Absorption Plant.



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Can be used to remove suspended oil from "tail-house" gases.

Can be installed for pipe or cylindrical stills to remove all unvaporized oil held in suspension before vapors reach dephlegmators.

It operates under pressure or Vacuum.

It operates without excessive back pressure.

For sizes, specifications, prices and further information write to

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WRIGHT-CALLENDER BUILDING LOS ANGELES, CALIFORNIA

To Prevent a Vacuum

The *Fulton Duplex Sensitive Vacuum (or Back Pressure) Regulator* is designed for use on a system discharging gases to a line under light vacuum, where it is desired to maintain atmospheric pressure.

This Regulator acts as a safeguard when used on the vapor lines connected to storage tanks and prevents the pulling of a vacuum when adjusted as a vacuum regulator.

The same regulator may be adjusted to act as a *Duplex Back Pressure Regulator* and will control a slight pressure above atmosphere with the same accuracy as when used to control a light vacuum.

Send for catalogue.

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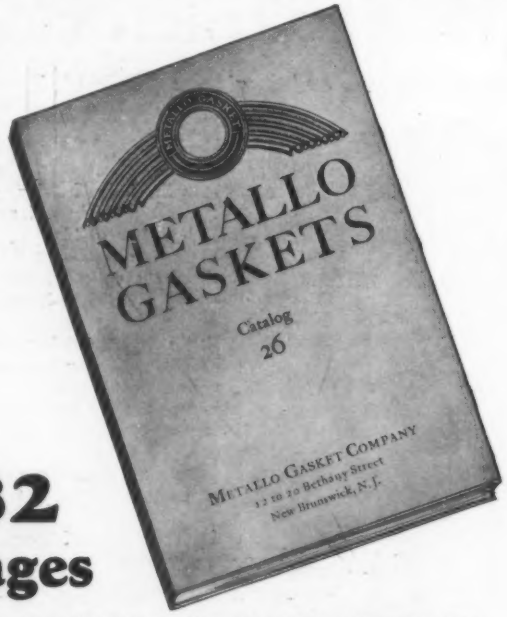

32 pages

of useful information on gaskets and valve discs for all industrial services and valuable data and tables in this book we send free on request.

METALLO Gasket Co.

New Brunsswick, N. J.

California Natural Gasoline Men Adopt By-Laws

(Continued from page 82)

nating Committee, to consist of five members of the Association, who will prepare a list of nominees to be presented to the membership at the Annual Meeting, at which time they shall be balloted upon by the membership of the Association.

Section 7. Vacancies, other than expired terms, in the Officers or Board of Directors shall be filled by the Board of Directors at a meeting called for that purpose, or by a written ballot taken by mail.

Article VI

Meetings

Section 1. The Annual Meeting of the Association shall be held the third Thursday in May of each year, or, at the discretion of the Executive Committee, within thirty (30) days thereof.

Section 2. Regular meetings of the Association shall be held the third Thursday of each month and /or at such places and times as may be deemed advisable by the Executive Committee. Fifty (50) members shall constitute a quorum for the transaction of business. The Secretary shall give members five (5) days' notice of all such meetings.

Section 3. Regular meetings of the Board of Directors shall be held at any time, upon five (5) days' notice, at the call of the President, or on shorter notice on consent of the majority of the Board to waive such notice. Five (5) members of the Board may call a meeting upon failure or refusal of the President to act. Seven (7) members of the Board shall constitute a quorum for the transaction of business.

Section 4. Meetings of the Executive Committee shall be called from time to time by the President, to be held at such times and such places as may be deemed advisable or expedient. Five (5) members of the Executive Committee shall constitute a quorum for the transaction of business.

Article VII

Dues

Section 1. Annual dues for Active members shall be $5.00 per year, payable in advance.

Section 2. Annual dues for Associate members shall be $5.00 per year, payable in advance.

Section 3. Any member failing to pay dues promptly within three months after they become due may, by action of the Executive Committee, be stricken from the rolls and thereafter not be permitted to participate in any of the meetings of the Association. Members in arrears cannot be reinstated to membership without full payment of all dues.

Article VIII

Committees

Section 1. The President shall appoint subject to the confirmation of the Executive Committee, the following standing committees:

Finance and Budget Committee.
Program Committee.
Membership Committee.
Gas Testing Committee.
Metering Committee.
Specifications Committee.
Technical Committee.

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AN incredibly short time in which to strip an entire tank car!

Yet an Oakite Service Man, with the aid of Oakite materials, accomplished this task for a certain western oil refiner. In this particular instance, the first car to be stripped was finished in exactly one hour! Every trace of the old paint had been removed, even from the frame underneath. Other cars were later prepared for repainting with similar time and labor savings over the method formerly employed.

Not only tank cars, but also storage tanks, steel drums, truck bodies, and other equipment can be stripped with lightning speed the Oakite way. Let our service man work with you on your next paint stripping job. His services are always available, without obligation.

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Oakite Service Men, cleaning specialists, are located at

Albany, Allentown, Pa., Altoona, Pa., *Atlanta, Ga., Baltimore, *Birmingham, Ala., *Boston, Bridgeport, *Brooklyn, Buffalo, *Camden, Charlotte, N. C., Chattanooga, Tenn., *Chicago, *Cincinnati, *Cleveland., *Columbus, O., *Dallas, *Davenport, *Dayton, Decatur, Ill., *Denver, *Des Moines, *Detroit, Erie, Pa., Flint, Mich., Fresno, Cal., *Grand Rapids, Harrisburg, Hartford, Houston, Texas, *Indianapolis, *Jacksonville, Fla., *Kansas City, *Los Angeles, Louisville, Ky., *Memphis, Tenn., *Milwaukee, *Minneapolis, *Montreal, Newark, Newburgh, N. Y., New Haven, *New York, *Oakland, Cal., *Omaha, Neb., *Philadelphia, *Pittsburgh, Portland, Me., *Portland, Ore., Providence, Reading, *Rochester, Rockford, Rock Island, *San Francisco, *Seattle, *St. Louis, South Bend, Ind., Syracuse, *Toledo, *Toronto, Trenton, N. J., *Tulsa, Okla., Utica, *Vancouver, B. C., Williamsport, Pa., Worcester.

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YORK Absorption Refrigerating Machines are built in either the the double pipe, atmospheric, or shell and tube type, and consist principally of the following parts:

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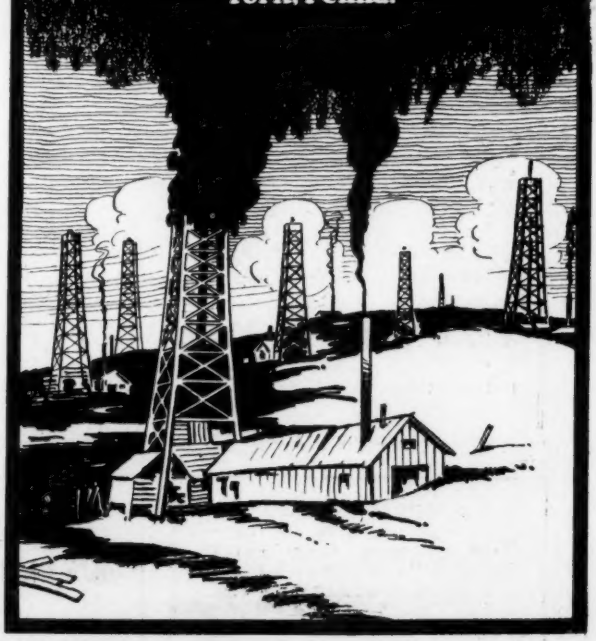
This equipment is particularly adaptable to Refinery requirements, and can be relied upon to deliver low, dry temperatures WHEN and WHERE needed.

Write the nearest YORK Branch (there are 74 of them) for full particulars.

YORK Manufacturing Company

Ice Making and Refrigerating Machinery Exclusively

York, Penna.



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When paint spraying outside work use the New Improved Pulmosan Dustproof Aluminum Respirator.

For painting inside of tanks and tank cars use the Pulmosan Airline Mask with blower attachment.

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Vilter Ammonia Compressors Fittings and Pipe Coils
Render Years of Reliable Service

Compressors built in several types and a great variety of sizes. Illustration is of a moderate speed type compressor.

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Electrically Driven Centrifuges
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WRITE
WILLIAMS, BROWN & EARLE, Inc.
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918 Chestnut St. Philadelphia, Pa.

Publications Committee.

Safety and Fire Prevention Committee.

The Finance and Budget Committee shall be composed of a total of four (4) members, consisting of the President, Secretary-Treasurer and two (2) members of the Executive Committee. It shall be the duty of this committee to discuss sources and allotment of income and prepare the budget for the ensuing year. It shall be their duty to arrange for, examine and approve annual audit of the books of the Association. It shall also be this committee's duty to approve the expenditure of monies provided for in the budget, this approval to be in advance, if possible; if not, as soon thereafter as possible. The Secretary-Treasurer shall file the signature of each member of this committee at the bank, and, in case of emergency through sickness or absence from the city of the Treasurer, the committee shall have the power to issue drafts on the Association when signed by any two (2) members of the committee. The action of this committee shall at all times be subject to the approval of the Executive Committee.

The Program Committee shall arrange suitable programs for all of the meetings, subject to the approval of the Executive Committee.

The Membership Committee shall pass on all applications for membership and do such things as may be found advisable to increase the membership of the Association.

The Gas Testing and Metering Committees shall gather such data and do such work in connection with the standardization of the work entrusted to their charge as may from time to time be deemed advisable by the Executive Committee.

The Specifications Committee shall gather such data and do such work in connection with specifications of natural gasoline as may from time to time be deemed advisable by the Executive Committee.

The Technical Committee shall gather such data and do such work in connection with technical subjects not handled by other committees which may from time to time be deemed advisable by the Executive Committee.

The Publications Committee shall have charge of releasing for publication any and all articles originating within the Association, or presented or read before the Association.

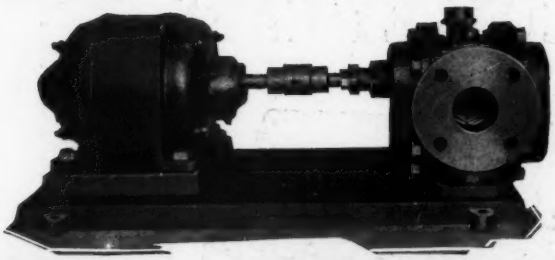
The Safety and Fire Prevention Committee shall gather such data and make such recommendations with reference to safety and fire prevention as may from time to time be deemed advisable by the Executive Committee.

Such other subjects may be entrusted to the above mentioned committees as may from time to time be deemed advisable by the President and Executive Committee.

These committees shall serve for one year, or until replaced by the President and Executive Committee.

Section 2. The President shall appoint from time to time, subject to the confirmation of the Executive Committee, such other committees as may be deemed ad-

Pump with gears



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are recommended for the severe pumping service encountered in the oil industry

Spur gear type for low speeds.
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Bulletin 17-A

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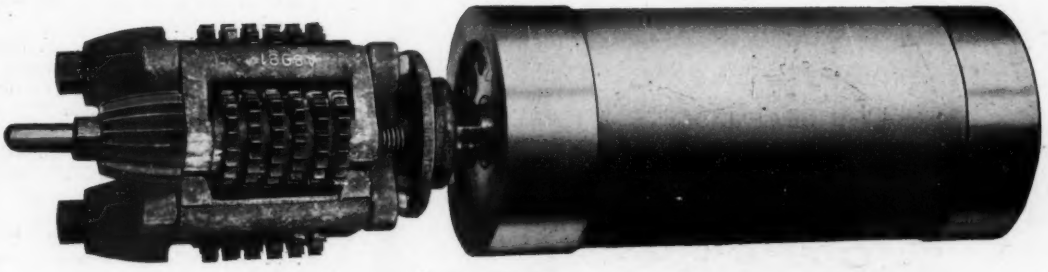
ROTO TUBE CLEANERS



Roto Air-Driven Heavy Duty Cleaner For

CRACKING STILLS

THE ROTO CO. Sussex Avenue and Newark St., **NEWARK, N. J.**

ASK ANY OF OUR LESSEES ABOUT CONLEY CARS

Our Equipment is in First Class Mechanical Condition

Cars for Gasoline, Fuel Oil, Lubricating Oils
Insulated Cars for Natural Gasoline

CONLEY TANK CAR COMPANY

Magnolia Bldg. DALLAS, TEXAS (*Write or Wire Our Nearest Office*) Oliver Bldg. PITTSBURGH, PA.

The Warwick

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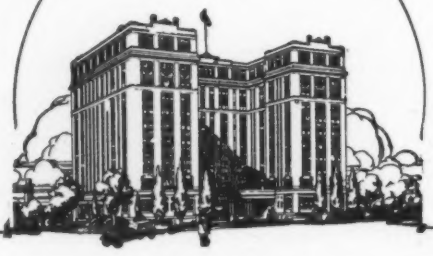

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Overlooking Hermann Park, offering early morning golf . . . breakfast on the roof . . . Time for rest and recreation. Ten minutes by Bus to Center of city.

TRANSIENT ROOMS $3 UP.

The South's Finest Apartment Hotel.

WALLACE C. O'LEARY
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Telephone HADLEY 6622

visable for the proper conduct of the Association.

Article IX

Order of Business

The order of business at meetings of the Board of Directors or the Executive Committee shall be as follows:

1. Opening.
2. Reading minutes of previous meeting.
3. Reports of Committees.
4. Voting on candidates for membership.
5. Reading communications received.
6. New applications for membership.
7. Unfinished business.
8. New business.
9. Bills against the Association.
10. Treasurer's report.
11. Closing.

The order of business at general meetings of the Association shall be, as follows:

1. Opening.
2. Reume of business transacted at meetings of Board of Directors or Executive Committee since previous meeting.
3. Reports of committees.
4. Reading communications received.
5. Unfinished business.
6. New business.
7. Secretary-Treasurer's report.
8. Program.
9. Closing.

Article X

Amendements

The Association, by a two-thirds vote of those present, may at any time change or amend these by-laws, provided, however, that due notice must be given all members in writing of any proposed change seven (7) days prior to meeting at which the proposed change will be voted on.

Committees Named

Subsequent to the meeting, the following committees were appointed by the president and confirmed by the executive committee:

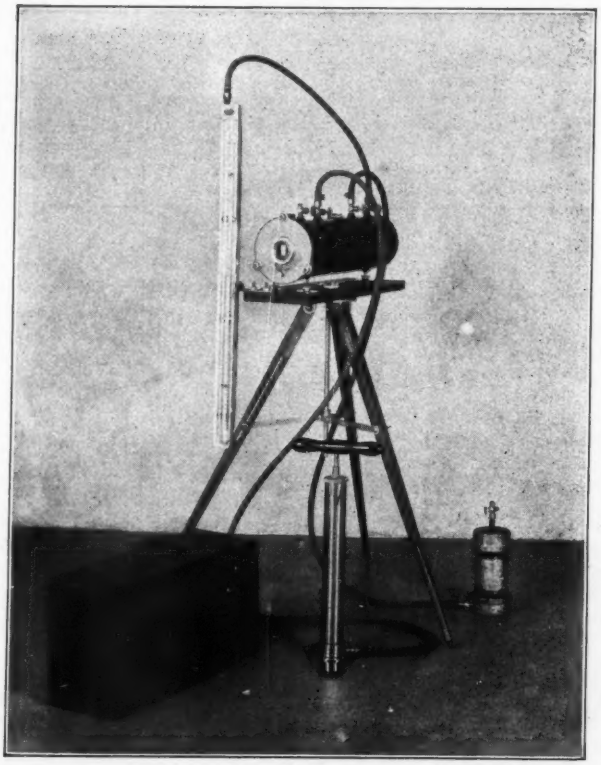
Finance and Budget—H. W. Parmelee, chairman; Paul Barton, treasurer; R. W. Garman and R. L. Ratcliffe, of the General Petroleum Corporation.

Program—H. L. Eggleston, chairman; Paul Barton, secretary; J. A. Campbell, O. C. Field, I. B. Funk, H. S. Holloway, California Gasoline Company; H. B. Pawson, Pan-American.

Gas Testing—J. S. Watson, chairman; P. S. McGruder of General Petroleum Corporation, vice-chairman; M. L. Arnold, Richfield; L. B. Cassiday, C. D. Gard, Union Oil; R. W. Heath, Signal; L. D. McClouth, Pan-American; Leland McMasters, Standard; L. J. Patrosso, Export; W. W. Robinson, Jr., California Gasoline; E. J. Squire, Shell; Eugene Tays, Lovell; L. O. Warner of Barton-Manning-Warner.

Publicity—I. B. Funk, chairman; Paul Barton, secretary; H. L. Eggleston, O. C. Field, H. W. Parmelee.

Membership—R. E. Beckley, chairman; P. R. Beauchamp, California Gasoline; Warren Bradford, Paul Daniel, Pan American; C. B. Edington, Edington Gasoline Company; Clarence Gotterba, Richfield; R. H. Green, Signal; John Herron,



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Recent experiments show the following:

Where strong acid conditions prevail use one coat Rubshell Priming and two coats Rubshell No. 2.

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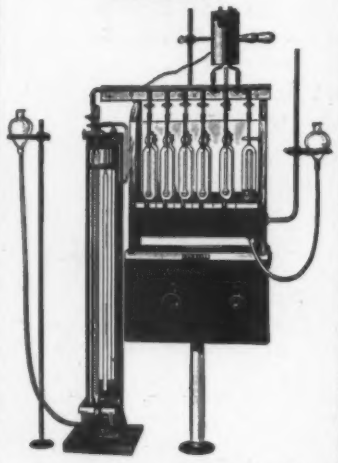
For the Gas and Oil Industries



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Shell; John N. Hicks, Superior Oil Company; W. A. Kirk, Export; H. L. McCarty, Union; Sid Richmond, Honolulu Consolidated.

Metering—J. S. Watson, chairman; Floyd E. Huff of the Standard, vice-chairman; R. M. Brown, Union; J. N. Hicks, Earl Haggard, General Petroleum; Ben Laulherl, Midway Gasoline Company; H. E. Moulton, C. C. M. O.; E. H. Pann, Pan-American; A. S. Semino, Shell; T. K. M. Smith, Industrial Fuel Supply Company; W. M. Young, California Gasoline Company.

Technical—J. S. Watson, chairman; E. D. Cummings, Shell; D. G. Geraldine, Pan-American; E. J. Lange, Associated; H. C. Marshall, Union; George McLaren, Standard; L. O. Warner of Barton-Manning-Warner; Garth Young, Signal.

Safety and Fire Prevention—H. L. Eggleston, chairman; B. F. Masten, Standard; J. K. Richardson, General Petroleum; T. T. Rissinger, Union; John Snyder, California Gasoline; R. S. Tulin, Shell.

Dallas, Texas.—The Primrose Refining Company resumed operations of its Wichita Falls refinery late in July. The plant has been shut down for a few months. At the Dallas plant of the Primrose Company George Dartois, formerly superintendent of refiners for H. H. Cross Company, has been made superintendent of operations, taking over his new duties during July. The Dallas plant is owned by an affiliated company operating under the name of the Primtex Refining Company.

Los Angeles.—Preliminary construction work has begun on the new refinery site close to Torrance, California, for the erection of the new plant of the General Petroleum Corporation, which is now operating a plant in the Los Angeles industrial district at Vernon, California. This old plant will eventually be dismantled and moved to the new site. One of the first steps consisted of the erection of an observation station for the study of prevailing winds and weather conditions. Automatic instruments are installed for keeping records day and night of the wind direction and velocity. The data secured in this manner will be used in determining the location of the various refinery buildings and equipment, such as distillation, cracking and treating units.

The work of grading and laying foundations for tanks is now under way.

Hyman-Michaels Company of Chicago has purchased the former oil refinery and tank farm of the Indiahoma Refining Company, East St. Louis, Illinois. This property consists of complete cracking and refining equipment, having a capacity of 10,000 barrels per day; also the gasoline plant, power plant and oil storage tanks ranging from 400 barrels to 55,000 barrels. Hyman-Michaels Company will dismantle the plant and sell the equipment.

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SEAMLESS STEEL STILL TUBES

Thousands of Babcock & Wilcox open hearth seamless steel still tubes are in service in refineries throughout the country.

These tubes have been supplied to various specifications, either with plain ends or upset as ordered.

Many of them are thirty feet long, made hot finished by a process perfected by this Company, for tubes of unusually long length.

The more common sizes are carried in stock at the Mill for immediate shipment.

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NEW ORLEANS .....344 Camp Street
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Clean your Condenser Tubes by Scouring

It takes less time

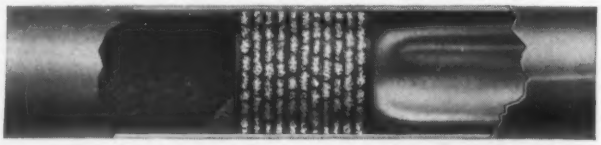
Another New Garlock Product

The Garlock Cord Plugs are an innovation in condenser tube cleaning. They brush and scour the inside wall of the tube. The ends of the many staggered cords extending beyond the cyclindrical wall of the plug sets up a frictional resistance to the inside surface of the tube. The plug shot through the tube by compressed air, working under the resistance, scours the inside surface down to the bright metal. It never leaves a film that retards the heat transfer.

The Factory Mark of a Product Made by trained Craftsmen

Garlock Cord Plugs are manufactured of tenacious resilient rubber and many long brush cords. The cords are insulated from each other by a rubber film. This prevents internal friction and gives long life to the plug.

Write for circular containing articles describing the method of cleaning with cord plugs and giving blue prints and instructions for making air gun to shoot the plugs. Sample plugs will also be furnished on request if outside diameter and gauge of tube is given.



When Garlock Cord Plugs are used for Condenser Tube Cleaning. The guaranteed vacuum can be maintained. The life of the condenser tubes prolonged. The condenser outage hours greatly reduced.

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for CLEANING CONDENSER TUBES

THE GARLOCK PACKING COMPANY, PALMYRA, N. Y.

Manufacturers of "Quality Controlled" Mechanical Packings

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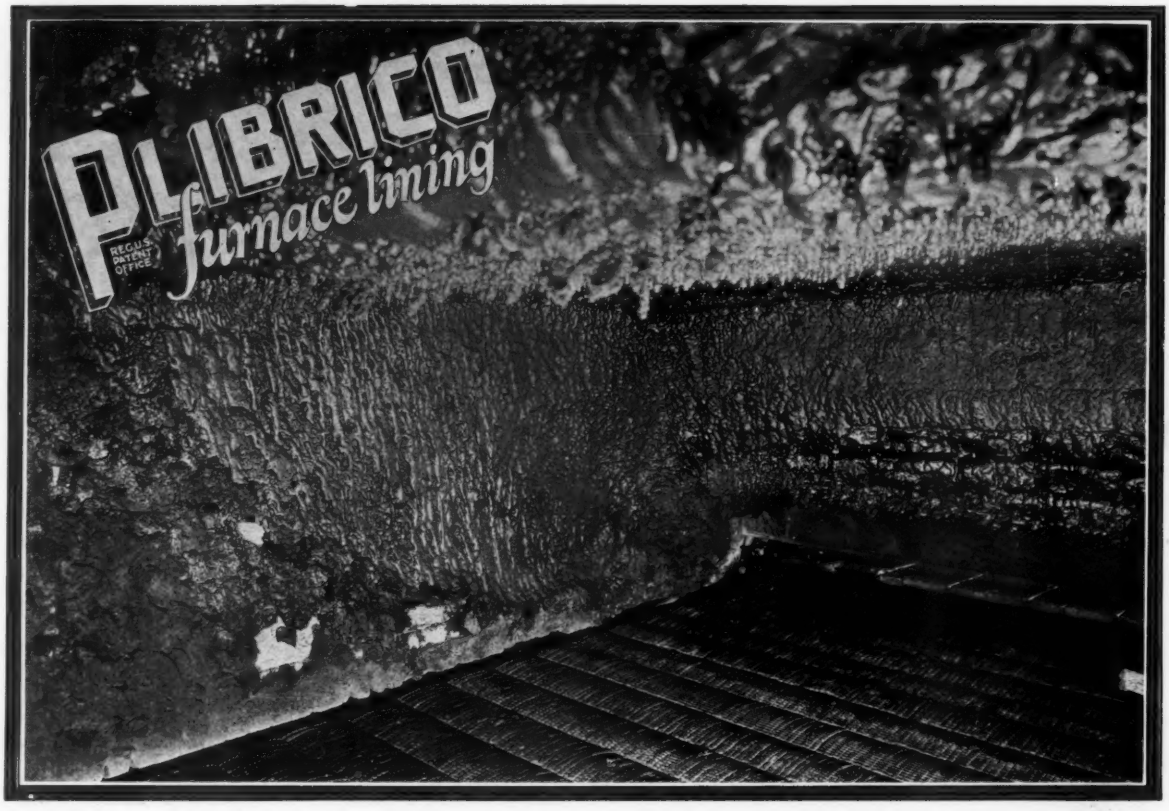

13,242 hours without repairs

THAT'S the record of the Plibrico wall shown in the photograph. The installation is in No. 9 boiler in a big Indianapolis utility plant. The boiler is 500 h.p., equipped with a Coxe Stoker, and operating at a constant 175% of rating and burning coke breeze.

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